

TM 43-0001-30

**TECHNICAL MANUAL
ARMY AMMUNITION DATA SHEETS
FOR
ROCKETS
ROCKET SYSTEMS
ROCKET FUZES
ROCKET MOTORS
(Federal Supply Class 1340)**

This copy is a reprint which includes current
pages from Changes 1 through 3

**HEADQUARTERS, DEPARTMENT OF THE ARMY
DECEMBER 1981**

Technical Manual
No. 43-0001-30

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 1 December 1981

ARMY AMMUNITION DATA SHEETS
FOR ROCKETS, ROCKET SYSTEMS, ROCKET
FUZES, ROCKET MOTORS
(Federal Supply Class 1340)

REPORTING OF ERRORS

You can help improve this manual. If you find any mistakes or know of a way to improve the procedures, please let us know. Mail your DA Form 2028 (Recommended Changes to Publications or Blank Forms), or DA Form 2028-2 located in the back of this manual direct to Commander, U. S. Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAY-T(D), Dover, NJ 07801-5001. A reply will be furnished to you.

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NO. 3)

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 15 October 1985

ARMY AMMUNITION DATA SHEETS
FOR
ROCKETS, ROCKET SYSTEMS, ROCKET FUZES,
ROCKET MOTORS (FSC 1340)

TM 43-0001-30, 1 December 1981, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number.

Remove pages

A
i and ii
3-33 and 3-34
3-37 thru 3-44

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A
i and ii
3-33 and 3-34
3-37 thru 3-44

2. File this change sheet in front of the publication for reference purposes.

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Official:

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General, United States Army
Chief of Staff

MILDRED E. HEDBERG
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-34B-R, Organizational Maintenance requirements for Small Rockets; Jatos; and 66MM LAW System M72; Plus, Direct, and General Support Maintenance requirements for Small Rockets, and Jatos..

Change)
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DEPARTMENT OF THE ARMY
Washington, D.C., 17 June 1983

ARMY AMMUNITION DATA SHEETS
FOR
ROCKETS, ROCKET SYSTEMS, ROCKET FUZES,
ROCKET MOTORS (FSC 1340)

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3-27 and 3-28

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Change)
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No. 1)

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 1 March 1983

TECHNICAL MANUAL
ARMY AMMUNITION DATA SHEETS
FOR
ROCKETS
ROCKET SYSTEMS
ROCKET FUZES
ROCKET MOTORS
(Federal Supply Class 1340)

TM 43-0001-30, 1 December 1981, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number.

Remove pages

A
i and ii
2-25 and 2-26
None

Insert pages

A
i and ii
2-25 and 2-26
3-33 thru 3-44

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To be distributed in accordance with DA Form 12-40, Organizational Maintenance requirements for Small Rockets, Jatos and 66MM Law System M72 and Direct and General Support Maintenance requirements for Small Rockets and Jatos.

CHAPTER 1

INTRODUCTION

1-1. PURPOSE:

a. This manual provides general and technical information concerning ground and aircraft rockets. It covers general characteristics, specific data, means of identification, precautions and general information on packing. General information pertaining to all types and kinds of conventional ammunition and explosives, and color coding for earlier manufactured munitions are contained in Technical Manual (TM) 9-1300-200. General information on care, handling, preservation, storing, shipping and destruction of ammunition and explosives is contained in TM 9-1300-206. Information on training of troops in tactical use of 3.5-in. rockets will be found on 66-mm rockets in FM 23-33.

b. The rockets and components described in chapters 2 and 3 belong to Federal Supply Class 1340. Other items used in conjunction with the rockets are covered in other publications.

1-2. SCOPE:

a. For each item of materiel, there are illustrations and descriptions together with characteristics and related data. Included in the related data are weights, dimensions, performance data, packing, shipping and storage data, type classification, and logistics control codes (LCC).

b. Information concerning supply, operation, and maintenance of items will be found in the publications referenced for those items. A complete listing of these

publications is maintained in Department of the Army (DA) Pam 310-series indexes.

c. Within this manual, items with the following type-classifications are included:

- (1) Standard (LCC-A, LCC-B), OTCM/AMCTCM
- (2) Contingency (CON)
- (3) Limited Procurement (LP)
- (4) Reclassified obsolete (OBS) for regular Army use, but used by National Guard or Reserve units.
- (5) Reclassified OBS for all Army use, but used by Marine Corps, Air Force or Navy.

(6) Reclassified OBS, no users, but US stocks remain. Items with the following type-classification are not included:

Reclassified OBS for all US use. No US stocks remain. (Foreign use or stock may remain.)

d. Numerical values, such as weights, dimensions, candlepower, etc., are nominal values, except when specified as maximum or minimum. Actual items may vary slightly from these values. Allowable limits can be obtained from the drawings indicated in the data sheets.

1-3. KEY TO ABBREVIATIONS AND SYMBOLS:

- AP ----- Armor piercing
- APC----- Armor piercing capped

APERS -----	Antipersonnel	MT -----	Mechanical time
AR -----	Army Regulation	MTSQ -----	Mechanical time and super-quick
AT -----	Antitank	MV -----	Muzzle velocity
BD -----	Base detonating	OBS -----	Reclassified obsolete
BE -----	Base ejection	PD -----	Point detonating
CP -----	Candle power	PDSQ -----	Point detonating super- quick
DA -----	Department of the Army	PI -----	Point initiating
DS -----	Discarding sabot	PIBD -----	Point initiating, base detonating
FM -----	Field manual	Prox -----	Proximity
FPS -----	Feet per second	PWP -----	Plasticized white phosphorous
FT -----	Feet	RAD -----	Ram air decelerator
G's -----	Force of Gravity	RAP -----	Rocket assisted projectile
HE -----	High explosive	RC -----	Resistance capacitance
HEAT-T-MP --	High explosive antitank with tracer, multi- purpose	RF -----	Radio frequency
HEDP -----	High explosive dual purpose	RPS -----	Revolutions per second
HEI -----	High explosive incendiary	S&A -----	Safety and arming device
HEP -----	High explosive plastic	SC -----	Supply cataloge
HERA -----	High explosive, rocket assisted	SD -----	Self destroying
HVAP -----	Hypervelocity, armor piercing	Sec -----	Seconds
HVT P -----	Hypervelocity, target practice	SM -----	Supply manual
Illum -----	Illuminating	SQ -----	Super-quick
JATO -----	Jet assisted take off	T -----	Time fuze or for training only
LAW -----	Light antitank weapon	-T -----	With tracer
(LP)-T -----	Test (DODAC)	TB -----	Technical bulletin
LSFFAR -----	Low-spin folding-fin aircraft rocket	TM -----	Technical manual
Mod -----	Modified	TP -----	Target practice
MM -----	Millimeter	TSQ -----	Time super-quick
MPS -----	Meters per second	VX-----	Persistent toxic (casu- alty) nerve gas
MPSM -----	Multipurpose sub- munitions	WP -----	White phosphorous
MS -----	Milliseconds		

1-4. METRIC CONVERSION CHART:

For conversions to metric measures:

CONVERSION CHART

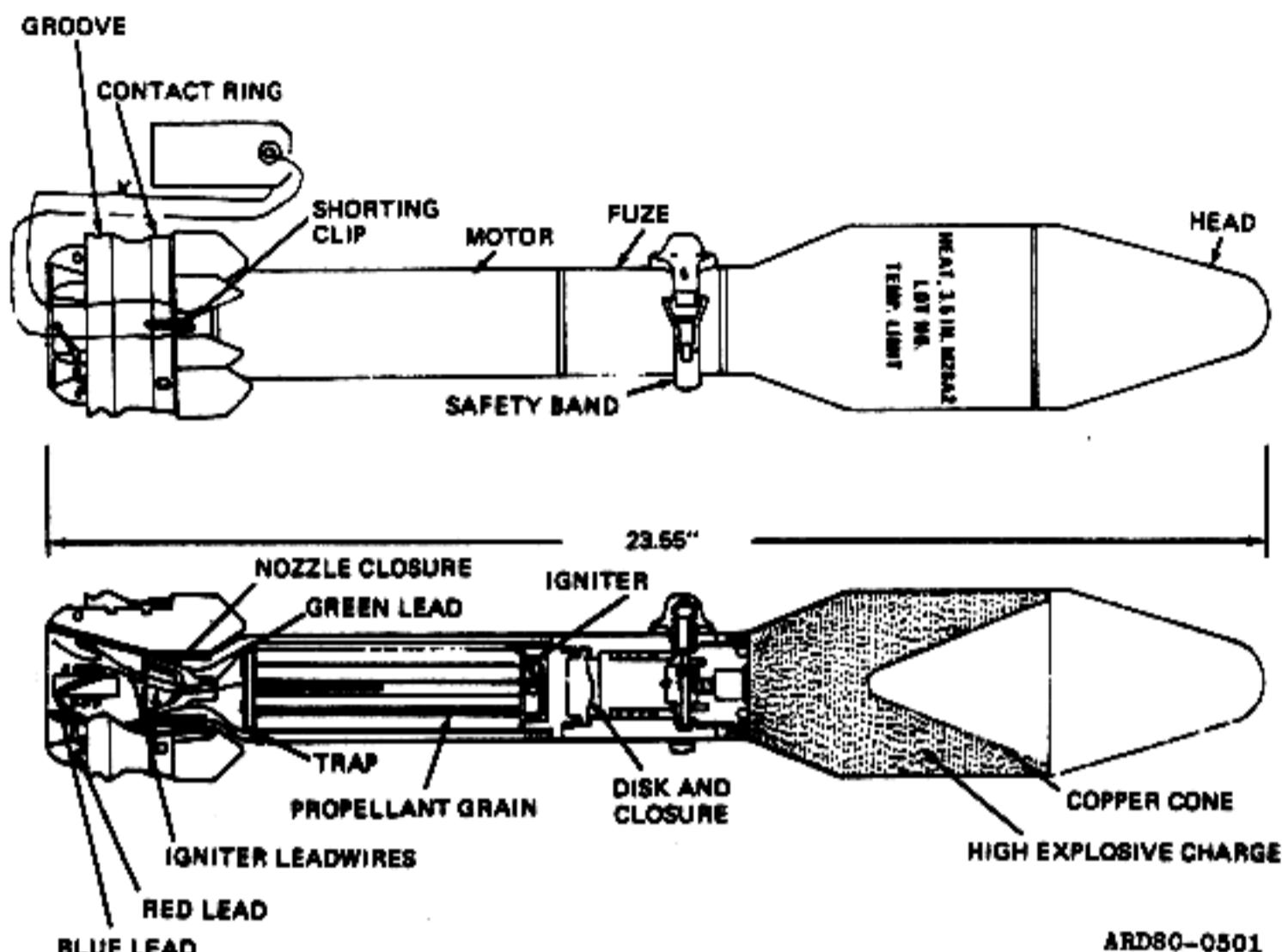
Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in.	inches	2.54	centimeters	cm
ft	feet	30.5	centimeters	cm
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in. ²	square inches	6.45	square centimeters	cm ²
ft ²	square feet	0.093	square meters	m ²
yd ²	square yards	0.836	square meters	m ²
mi ²	square miles	2.59	square kilometers	km ²
	acres	0.405	hectares	ha
WEIGHT				
oz	ounces	28.3	grams	g
lb	pounds	0.454	kilograms	kg
	short tons (2000 lb)	0.907	tonnes	t
VOLUME				
fl oz	fluid ounces	29.6	milliliters	ml
pt	pints	0.473	liters	l
qt	quarts	0.946	liters	l
gal	gallons	3.79	liters	l
ft ³	cubic feet	0.028	cubic meters	m ³
yd ³	cubic yards	0.764	cubic meters	m ³

Symbol	When You Know	Multiply by	To Find	Symbol
TEMPERATURE (exact)				
°F	Fahrenheit	5/9 (after subtracting 32)	Celsius temperature	°C
For conversions from metric measures:				
Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.039	inches	in
cm	centimeters	0.394	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
AREA				
cm ²	square centimeters	0.155	square inches	in ²
m ²	square meters	1.20	square yards	yd ²
km ²	square kilometers	0.386	square miles	mi ²
ha	hectares (10,000 m ²)	2.47	acres	
WEIGHT				
g	grams	0.035	ounces	oz
kg	kilograms	2.20	pounds	lb
t	tonnes (1000 kg)	1.10	short tons	
VOLUME				
ml	milliliters	0.034	fluid ounces	fl oz
l	liters	2.11	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.264	gallons	gal
m ³	cubic meters	35.3	cubic feet	ft ³
m ³	cubic meters	1.31	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

CHAPTER 2
GROUND ROCKETS

Approved by the Director of Defense Research and Engineering

ROCKET, HIGH-EXPLOSIVE, 3.5-INCH: AT, M28A2

Type Classification:

STD (LCC-B) OTCM 36841 Jul 58

cone whose apex faces aft and acts to shape the high explosive charge Composition B (Comp B).

Use:

The M28A2 HEAT rocket is used primarily against armored targets, tanks and secondary targets, such as gun emplacements, pillboxes and personnel. It is capable of penetrating heavy armor at angles of impact greater than 30°. In an antipersonnel role, it has a fragmentation area 10 yd wide and 20 yd deep.

b. The base detonating (BD) rocket fuze M404A2 consists of a body which contains the functioning parts; a safety band, a detonator and a booster pellet. The fuze body and safety band are olive drab. The fuze mechanism consists of an activating plunger, a setback spring, a setback sleeve, a firing pin assembly, a detent spring, an ejection pin and an ejection spring. The spring-loaded ejection pin passes through the fuze body.

Description:

a. The warhead is cylindrical and tapered. The forward end, called the ogive, is thin metal and hollow. The rear end, threaded internally to receive the fuze which is encircled by a safety band. The warhead contains a copper

c. The motor assembly consists of a tube which houses the propellant and igniter. The fin assembly is securely attached to this tube. The front end of the tube is assembled to the base of the fuze. The rear end forms a nozzle. The cylindrical motor cavity is divided into four

sections by two spacer plates which support the grains of propellant powder.

d. Each grain of propellant is 5-in. long and approximately 3/8-in. in diameter. Three grains are placed in each of the four sections formed by the spacer plates. Each lot of propellant is adjusted at the time of manufacture to give standard velocity. The igniter ignites the propellant.

e. The igniter consists of a short, cylindrical plastic case containing a small black powder charge and an electrical squib. It is assembled in the forward end of the motor on top of the propellant, spacer plates. The leads of the electrical squib, running parallel to the grains of propellant, pass from the igniter through the nozzle into the expansion cone. A green lead (ground) wire is connected to the aluminum support ring of the contact ring assembly. A red lead (positive) wire is attached to a pin which is insulated from the support ring, but is in contact with the copper contact band. These connections are positioned 180° apart. Blue lead is used for test purpose only.

f. The fin assembly consists of six aluminum alloy fins and a contact ring assembly. The contact ring assembly, which encircles the fins, consists of three rings. The aluminum support ring, which is innermost, is separated from the copper contact ring by a plastic insulating ring. The fins are spot welded to the expansion cone, and the expansion cone is press fitted to the rear of the motor tube. The M24 and the M86 off-route mines utilizing M28A2 HEAT rockets are described in TM 43-0001-36.

Differences between Models:

The BD rocket fuze M404A1 is similar to BD rocket fuze M404A2. The M404A1 differs principally in minor design changes of the functioning parts and the shape of the safety band.

Functioning:

a. When the safety band is removed, the ejection pin moves outward approximately 3/8 of an inch but still prevents all parts of the fuze mechanism from moving. When the rocket is in the firing chamber, the ejection pin is partially depressed by the chamber, thereby freeing the setback sleeve so it can move to the rear when the rocket is fired. The fuze is still safe, since the ejection pin prevents movement of the actuating sleeve and firing pin.

b. If it becomes necessary to remove the rocket from the launcher, the ejection pin will move outward and re-engage the setback sleeve. This returns the fuze to its original safe condition.

c. When the rocket is fired, the force of inertia causes the setback sleeve to move rearward. It is held in its rearward position by the lockpin. When the rocket leaves the muzzle of the launcher, the ejection pin is thrown clear of the fuze by the ejection pin spring. The fuze is then fully armed.

d. During flight, the firing pin lever and firing pin spring prevent the firing pin from striking the detonator. The creep spring retards the forward movement of the plunger and actuating sleeve. The action of the creep spring prevents the fuze from firing should the rocket strike light objects such as thin brush or undergrowth.

e. Upon impact with a more resistant object, the plunger and actuating sleeve move forward until the sleeve hits the firing pin lever. This causes the firing pin to strike and detonate the warhead.

Tabulated Data:

Rocket:

Model -----	M28A2
Type -----	Service
Diameter -----	3.5 in.
Length (max) --	23.55 in.
Weight -----	9.00 lb

Performance:

Operating temperature limits -----	-20° to +120°F (-28.6 to +48.4C)
Muzzle velocity (at 70°F) (approx) -----	325 ft/sec (99 mps)

Warhead:

Type -----	HEAT
Body -----	Steel
Color -----	Olive drab w/yellow markings
Diameter -----	3.5 in.
Length -----	10.5 in.
Weight -----	4.47 lb

High-explosive train:

Detonator ----	M41
Booster (tetryl) -----	0.17 oz (4.81 g)
Filler (warhead) Type -----	Comp B
Weight (approx) -----	1.88 lb (.854 kg)

Fuze:

Model -----	M404A1 or M404A2
Type -----	Base detonating
Diameter -----	2.0 in.

Length:

Overall -----	3.48 in.
To shoulder (max) -----	2.94 in.
Weight -----	1.16 lb
Arming distance -----	10 ft (3.05 m)

Motor:

Diameter (at fins) -----	3.5 in.
Length -----	10.41
Weight -----	3.30 lb
Thrust -----	6,000 - 10,000 lb

Propelling initiating train:

Igniter:

Model -----	M20A1
Charge (black powder) -----	0.13 ± 0.007 (3.5 ± .2 g)

Electric squib -----	M2
----------------------	----

Propelling charge:

Propellant:

Model -----	M7
Type -----	Solvent
Configuration -	Monoperforated, cylindrical, extruded grains (12)
Weight -----	0.44 lb (198 g)

Burning time:

At -20°F -----	0.05 sec
At +120°F ---	0.02 sec

Launchers -----	M20, M20A1, M20A1B1, M20B1
-----------------	-------------------------------

Packing -----	1 per metal/fiber container, 3 containers per wooden box
---------------	--

Box:

Weight (with contents) -----	53.0 lb
------------------------------	---------

Dimensions:

W/metal
container --- 29-9/16 in. x
14-1/16 in. x
16-19/32 in.

W/fiber

container --- 29-3/16 in. x
13-7/8 in. x
16-19/32 in.

Cube:

W/metal
container ---- 1.6 ft³

W/fiber
container ---- 1.5 ft³

DODAC ----- 1340-H600

Shipping and storage data:

Storage class/
SCG ----- 1.1E
DOT shipping
class ----- A
DOT designation - ROCKET AMMUNI-
TION WITH EXPLO-
SIVE PROJECTILES

Field storage -- Group E

Drawings:

Complete assy -- 9211744 (82-6-22)

Loading assy

(head) ----- 82-16-36

Loading assy

(motor) ----- 9225502 (82-16-35)

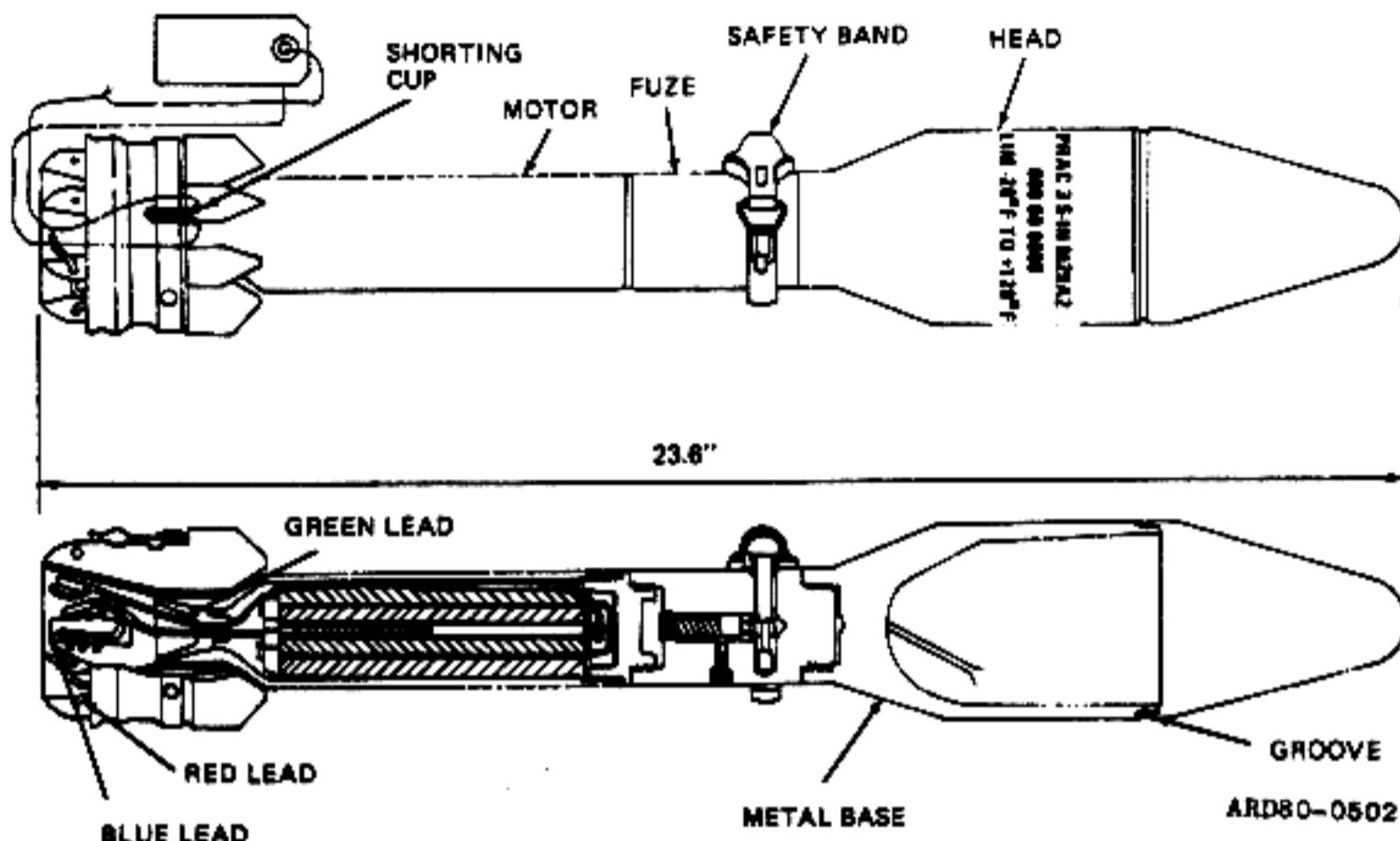
Packing (inner) -- 7549038

Packing (outer) -- 7549040

References:

TM 9-1340-222-34

ROCKET, PRACTICE, 3.5-INCH M29A2

Type Classification:

STD (LLC-B) AMCTCM 36841 (M29A2)

Use:

For training personnel in use, care and handling of service rockets.

Description:

a. The warhead is completely inert. The practice rockets can be fired at buttoned-up, modified target tanks without danger to tank crews. The practice rockets have the same flight characteristics as the HEAT rocket.

b. The dummy fuze rocket M405 which serves as a coupling for the warhead and motor, is cylindrical. It is threaded externally at the forward end to fit into the

warhead assembly, and internally at the rear end to receive the motor assembly. A safety band fits around the seals and fuze. This fuze incorporates a double-locking, bore-riding, round ejection pin assembly simulating that used in base detonating (BD) fuze M404A2. The body of the fuze and the safety band are painted blue.

c. The motor assembly consists of a tube which houses the propellant and igniter. The fin assembly is securely attached to this tube. The front end of the tube is assembled to the base of the fuze. The rear end forms a nozzle. The cylindrical motor cavity is divided into four sections by two spacer plates which support the grains of propellant powder.

d. Each grain of propellant is 5-in. long and approximately 3/8-in. in

diameter. Three grains are placed in each of the four sections formed by the spacer plates. Each lot of propellant is adjusted at the time of manufacture to give standard velocity. The igniter ignites the propellant.

e. The igniter consists of a short, cylindrical plastic case containing a small black powder charge and an electrical squib. It is assembled in the forward end of the motor on top of the propellant spacer plates. The leads of the electrical squib, running parallel to the grains of propellant, pass from the igniter through the nozzle into the expansion cone. A green lead (ground) wire is connected to the aluminum support ring of the contact ring assembly. A red lead (positive) wire is attached to a pin which is insulated from the support ring, but is in contact with the copper contact band. These connections are positioned 180° apart. Blue lead is used for test purpose only.

f. The fin assembly consists of six aluminum alloy fins and a contact ring assembly. The contact ring assembly, which encircles the fins, consists of three rings. An aluminum support ring, which is innermost, is separated from the copper contact ring by a plastic insulating ring. The fins are spot welded to the expansion cone; the expansion cone is press-fitted to the rear of the motor tube.

Differences between Models:

a. The M29A1 and M29A2 rockets are similar in appearance to the M28A2. The M29 series differ in that they have a crimping groove at the juncture of the warhead body and ogive. The rockets of an early manufacture are assembled with M28A2 rocket warhead metal parts inert loaded with plaster of paris.

b. The M29A1 warhead differs from the M29A2 warhead in the head and trap and

spacer assembly. The ogive is attached to the head body of four screws staked to the ogive. Some rockets may have the cast trap and square spacer blades.

The warhead being inert, no functions occur when the rocket is fired. The rocket is strictly for training purpose.

Tabulated Data:

Rocket:

Model -----	M29A2
Type -----	Practice
Diameter -----	3.5 in.
Length (max) ---	23.6 in.
Weight (approx) -----	9.00 lb

Performance:

Operating temperature limits-----	-20° to +120°F (-28.6 to +48.4°C)
Muzzle velo- city (at 70°F, approx)-----	334 fps (101.9 mps)
Range (max, approx)-----	945 yd (863.7 m)

Warhead:

Type -----	Inert
Body -----	Cast iron
Color -----	Blue w/white markings
Diameter -----	3.5 in.
Length -----	10.5 in.
Weight -----	4.47 lb

Fuze:

Model-----	M405A2
Type -----	Dummy
Diameter -----	2.0 in.

Length:

Overall -----	3.42 in.
To shoulder (max)-----	2.94 in.
Weight -----	1.01 lb

Motor:

Diameter (at fins) ----- 3.5 in.
 Length ----- 10.41 in.
 Weight ----- 3.30 lb
 Thrust ----- 6,000 to 10,000 lbs

Box:

Weight (with contents) ----- 53.0 lb
 Dimensions:
 W/metal container --- 29-9/16 in. x 14-1/16 in. x 6-19/32 in.

Propellant initiating train:**Igniter:**

Model----- M20A1
 Charge (black powder) ---- 0.125 ± 0.007 oz
 3.54 ± .2 g)

Electrical squib ----- M2

Propelling charge:**Propellant:**

Model ----- M7
 Type ----- Solvent
 Configuration- Monoperforated, cylindrical extruded grains (12)

Weight (new type) ----- 0.44 lb (200 g)

Burning time:

At -20°F --- 0.05 sec
 At +120°F -- 0.02 sec

Launchers:

M29A2 ----- M20, M20A1,
 M20A1B1, M20B1
 M29A1 ----- M20, M20B1

Packing ----- 1 per metal/fiber container; 3 containers per wooden box

W/fiber

container --- 29-3/16 in. x 13-7/8 in. x 6-19/32 in.

Cube:

W/metal
 container ----- 1.6 ft³
 W/fiber
 container ----- 1.5 ft³

Shipping and storage data:

Storage class/
 SCG ----- 1.2C (12)
 DOT shipping
 class ----- B
 DOT
 designation --- ROCKET AMMUNITION WITH EMPTY PROJECTILES

Field storage-- Group C
 DODAC ----- 1340-H601

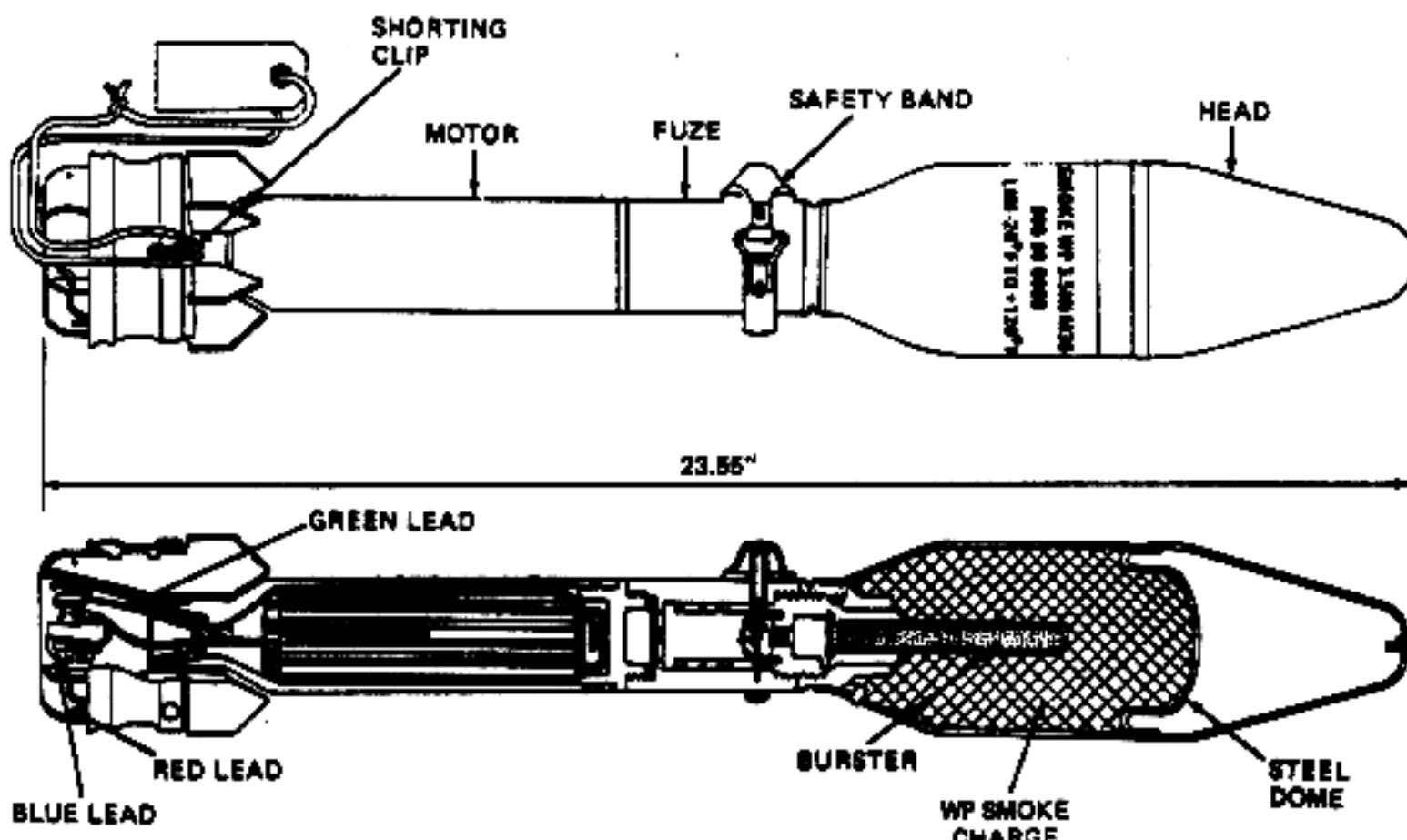
Drawings:

Complete assy - 82-6-23
 Loading assy -- 82-6-23
 Fuze ----- Dummy 72-5-16
 Packing (inner)- 7549038
 Packing (outer)- 7549040

References:

TM 9-1340-222-20
 TM 9-1340-222-34

ROCKET, GROUND: 3, 5-INCH SMOKE (WP) M30



ARD60-0503

Type Classification:

(obsolete) was AMCTCM STD (LCC-B)
36841 Jul 58

of the WP smoke warhead, base detonating (BD) fuze M404A1 or M404A2, and the service motor assembly.

Use:

The 3.5-in. white phosphorous (WP), M30 smoke rocket is intended for smoke screening purposes.

Description:

a. Smoke rocket, 3.5-in. WP, M30 is fired in the same manner as rocket M28A2. On impact, the rocket bursts to produce a spray of phosphorous particles. These ignite on contact with air, generating dense white smoke. The smoke itself is harmless, but the burning particles produce painful burns. In external contour, the rocket is similar to the M28A2. Rocket M30 consists

b. Rocket fuze BD M404A2 consists of a body which contains the functioning parts; a safety band, a detonator and a booster pellet. The fuze body and safety band are olive drab. The fuze mechanism consists of an activating plunger, a setback spring, a setback sleeve, a firing pin assembly, a detent spring, an ejection pin and an ejection spring. The spring-loaded ejection pin passes through the fuze body.

c. The motor assembly consists of a tube which houses the propellant and igniter. The fin assembly is securely attached to this tube. The front end of the tube is assembled to the base of the fuze. The rear end forms a nozzle. The cylindrical motor cavity is divided into four

sections by two spacer plates which support the grains of propellant powder.

d. Each grain of propellant is 5-in. long and approximately 3/8-in. in diameter.

Three grains are placed in each of the four sections formed by the spacer plates. Each lot of propellant is adjusted at the time of manufacture to give standard velocity. The igniter ignites the propellant.

e. The igniter consists of a short, cylindrical plastic case containing a small black powder charge and an electrical squib. It is assembled in the forward end of the motor on top of the propellant spacer plates. The leads of the electrical squib, running parallel to the grains of propellant, pass from the igniter through the nozzle into the expansion cone. A green lead (ground) wire is connected to the aluminum support ring of the contact ring assembly. A red lead (positive) wire is attached to a pin which is insulated from the support ring, but is in contact with the copper contact band. These connections are positioned 180° apart. Blue lead is used for test purpose only.

f. The fin assembly consists of six aluminum alloy fins and a contact ring assembly. The contact ring assembly, which encircles the fins, consists of three rings. An aluminum support ring, which is innermost, is separated from the copper contact ring by a plastic insulating ring. The fins are spot welded to the expansion cone, and the expansion cone is press fitted to the rear of the motor tube.

Differences between Models:

a. This warhead is generally similar to that of rocket M28A2, except that it has a charge of white phosphorous (WP). At the rear, it has a union internally threaded to receive the fuze. The burster casing (M8)

is press-fitted into the union, and the steel body is fitted over it. The steel ogive and the internal steel dome, which closes the forward end of the filler cavity are attached to the body.

b. This fuze is similar to BD rocket fuze M404A2. The M404A1 differs principally in minor design changes of the functioning parts and the shape of the safety band.

Functioning:

a. When the safety band is removed, the ejection pin moves outward approximately 3/8 of an inch but still prevents all parts of the fuze mechanism from moving. When the rocket is in the firing chamber, the ejection pin is partially depressed by the chamber, thereby freeing the setback sleeve so it can move to the rear when the rocket is fired.

b. The fuze is still safe, since the ejection pin prevents movement of the actuating sleeve and firing pin.

c. If it becomes necessary to remove the rocket from the launcher, the ejection pin will move outward and re-engage the setback sleeve. This returns the fuze to its original safe condition.

d. When the rocket is fired, the force of inertia causes the setback sleeve to move rearward. It is held in its rearward position by the lockpin. When the rocket leaves the muzzle of the launcher, the ejection pin is thrown clear of the fuze by the ejection pin spring. The fuze is then fully armed.

e. During flight, the firing pin lever and firing pin spring prevent the firing pin from striking the detonator. The creep

spring retards the forward movement of the plunger and actuating sleeve. The action of the creep spring prevents the fuze from firing should the rocket strike light objects such as thin brush or undergrowth.

f. Upon impact with a more resistant object, the plunger and actuating sleeve move forward until the sleeve hits the firing pin lever. This causes the firing pin to strike and detonate the burster.

Tabulated Data:

Rocket:

Model ----- M30
 DODAC ----- 1340-H602
 Assy drawing-- 82-6-26
 Type ----- Smoke
 Diameter ----- 3.5 in.
 Length (max) -- 23.55 in.
 Weight (approx)- 9.00 lb

Performance:

Operating
 temperature
 limits ----- -20° to +120°F
 (-28.6° to +48.4°C)

Muzzle velocity
 (at 70°F,
 approx) ----- 317 fps (96.7 mps)
 Range (max,
 approx) ----- 945 yd (863.7 m)

Warhead:

Type ----- Chemical
 Body ----- Steel
 Color----- Gray w/yellow
 markings
 Diameter ----- 3.45 in.
 Length ----- 10.6 in.
 Weight ----- 4.47 lb

High-explosive train:

Detonator ---- M41
 Booster
 (tetryl) ---- 0.17 oz (4.81 g)
 Type ----- WP
 Weight(approx)- 2.23 lb (1.01 kg)

Fuze:

Model ---- M404A1 or M404A2
 Type ---- BD

Motor:

Diameter
 (at fins) --- 3.5 in.
 Length ----- 10.41 in.
 Weight ----- 3.30 lb
 Thrust ----- 6,000 to 10,000 lb

Propelling initiating train:

Igniter:

Model --- M20A1
 Charge
 (black
 powder) -- 0.125 ± 0.007 oz
 (3.54 ± .2 g)
 Electric
 squib ---- M2

Propelling charge:

Propellant:

Model --- M7
 Type ----- Solvent
 Configura-
 tion ----- Monoperforated, cyl-
 indrical, extruded
 grains (12)

Weight (new
 type) ----- 0.44 lb (200 g)

Burning time:

At -20°F - 0.05 sec
 At +120°F- 0.02 sec

Launchers---- M20, M20A1, M20A1B1,
 M20B1

Packing ----- 1 per metal/fiber con-
 tainer; 3 containers per
 wooden box

Box:

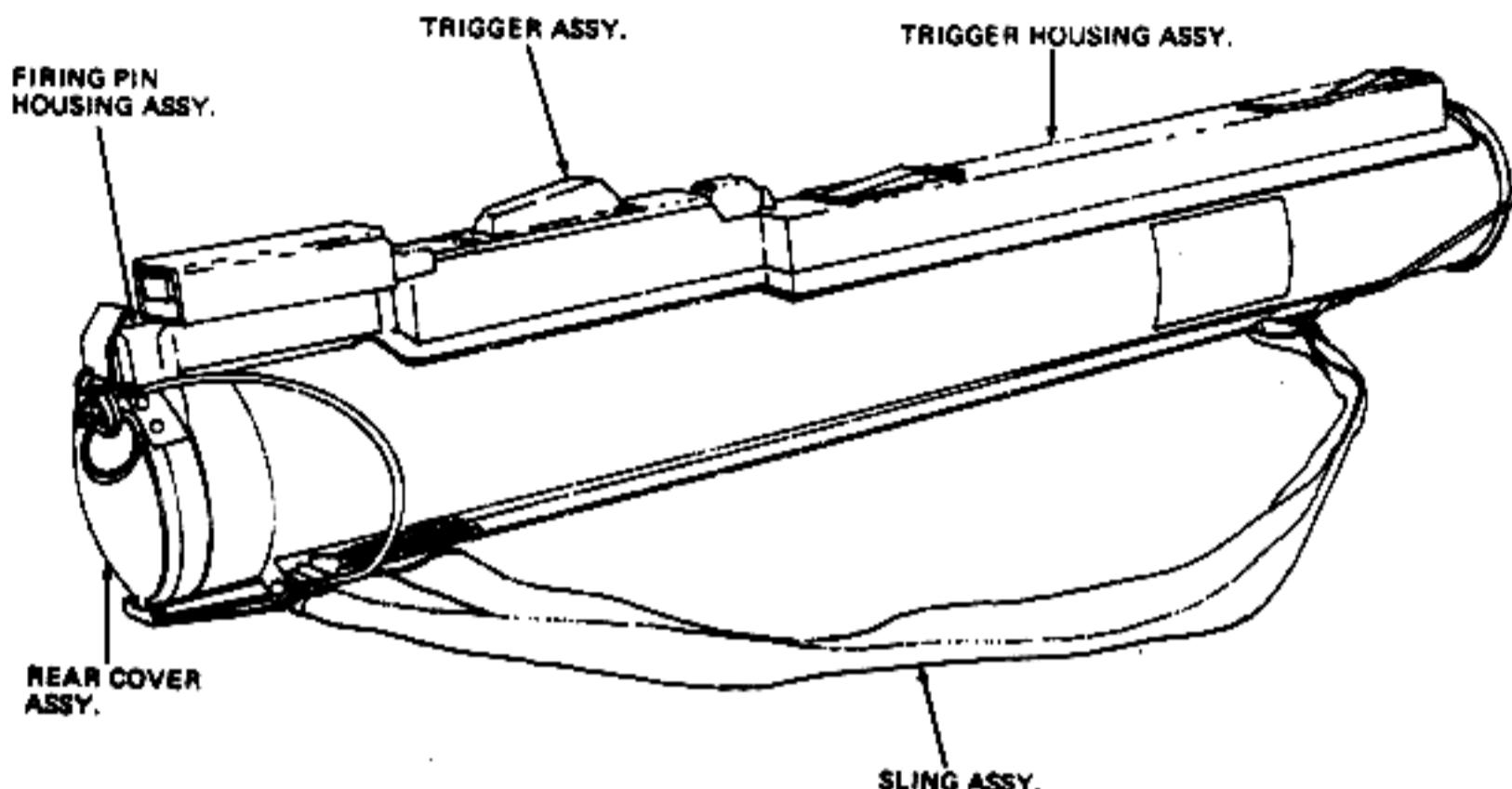
Weight (with
 contents)--- 53.0 lb

Dimensions:

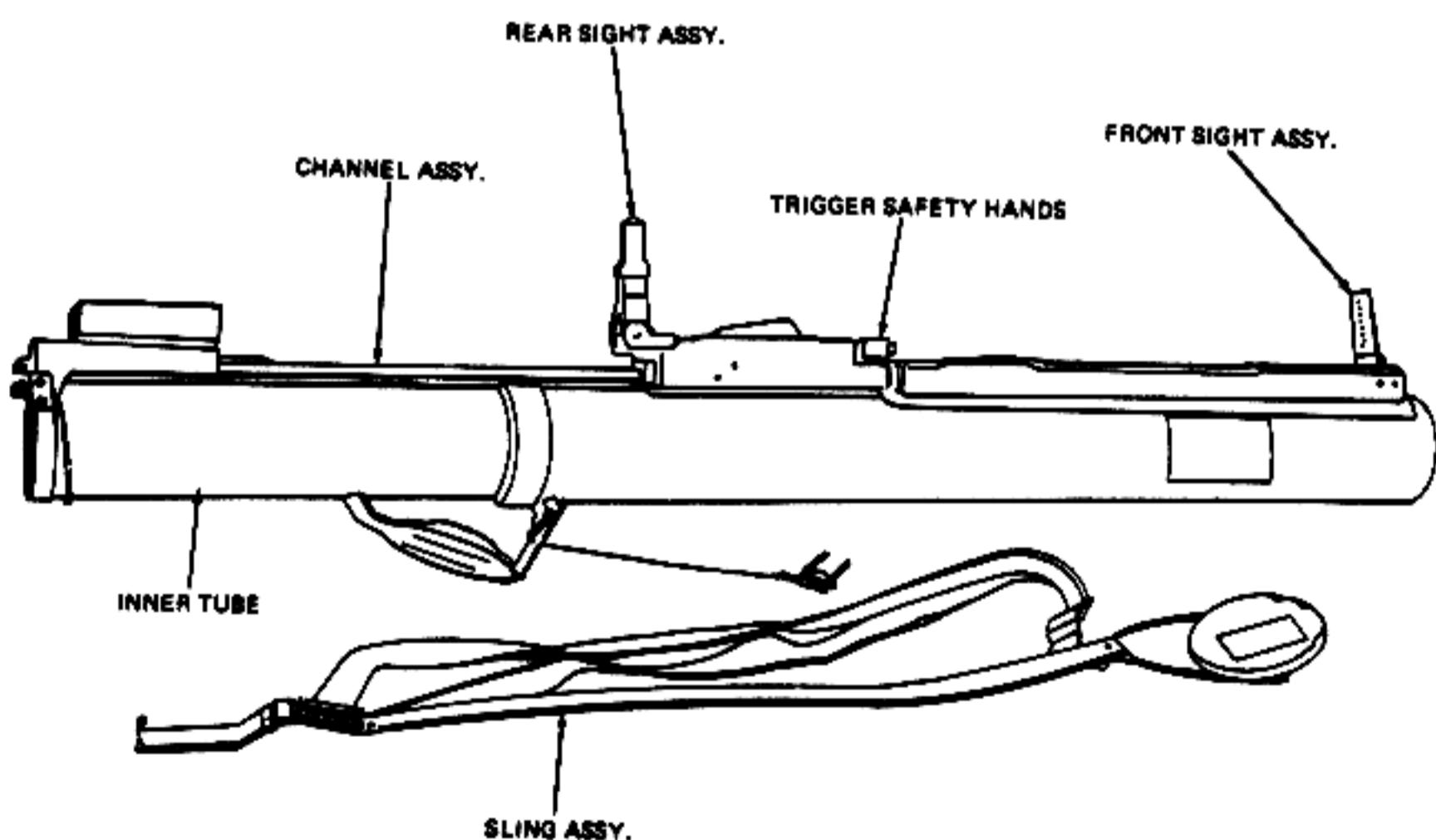
W/metal
 container - 29-9/16 in. x 14-1/16
 in. x 6-19/32 in.

W/fiber container ---	29-3/16 in. x 13-7/8 in. x 6-19/32 in.	Field storage -- Group H DODAC ----- 1340-H602
Cube: W/metal container ---- 1.6 ft ³		
W/fiber container ---- 1.5 ft ³		
Shipping and storage data: Storage Class/ SCG ----- 1.2H (12)		
DOT shipping class ----- A		
DOT designation ---	ROCKET AMMUNITION WITH SMOKE PROJECTILES	Drawings: Complete assembly ----- 82-6-26 Loading assembly ----- 82-16-39 Fuze (M404A2, type BD) ----- 9209515 Packing (inner) - 7549038 Packing (outer) - 7549040
References: TM 9-1340-222-20 TM 9-1340-222-34		

LIGHT ANTITANK WEAPON (LAW) SYSTEM M72 SERIES

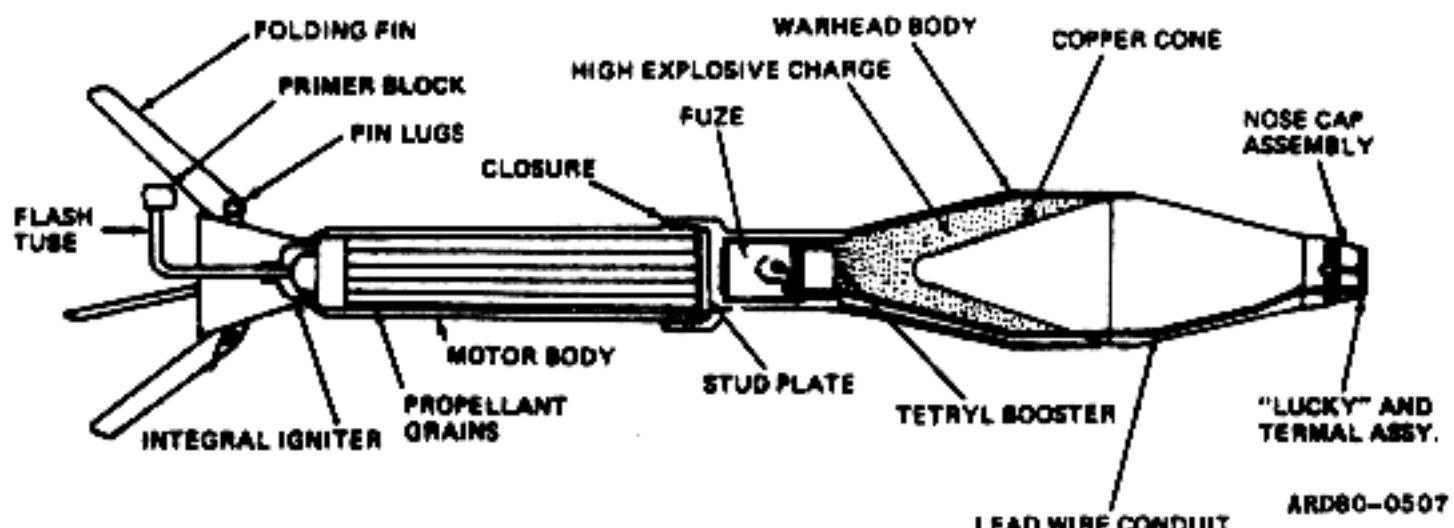
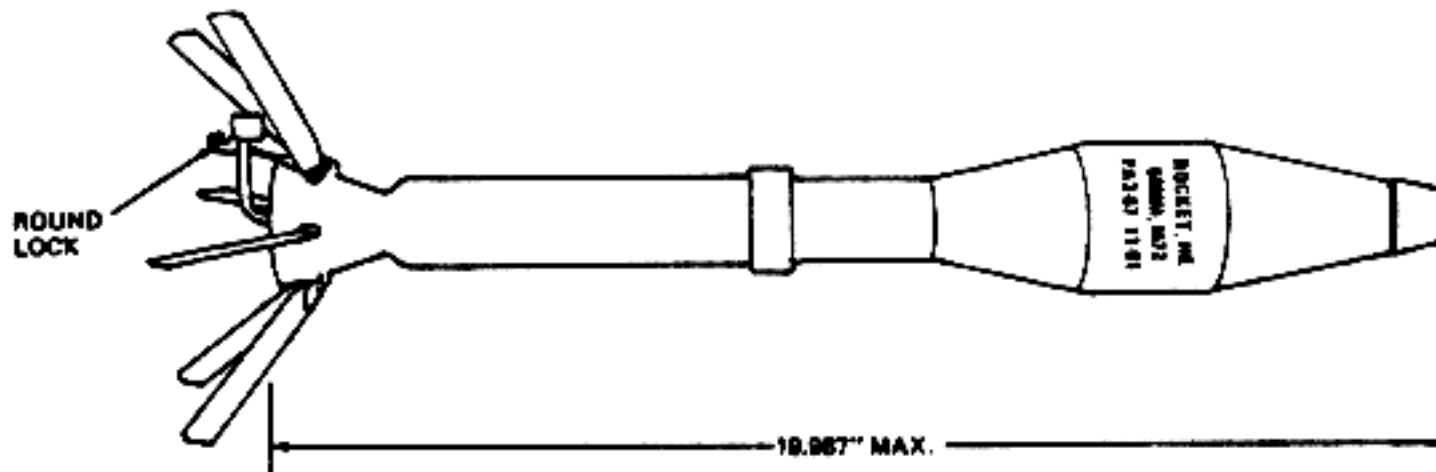


ARD80-0504A



ARD80-0504B

ROCKET, HEAT, 66MM, M72, M72A1, M72A2, AND M72A3

Type Classification:

M72 & M72A1 OBS-MSR-05806019.
 M72A2 - STD LCC-B-MSR-09806022.
 M72A3-STD LCC-A-MSR-09806021.

Use:

Primarily for penetration of armored targets. It may be used effectively against bunkers and other light field fortifications.

- a. Launcher.
- b. Rocket.

Description:

a. The packaged compact portable weapon is issued as a single shot shoulder-fired launcher with a HEAT rocket and sling assembly. The rocket launcher is a tubular, telescoping, smooth-bore, open-breech

type weapon. The outer (front) tube is made of plastic, impregnated fiberglass; the inner (rear tube) is made of aluminum. The inner tube is oriented with respect to the outer tube by the channel assembly, which rides in an alinement slot in the trigger housing assembly. The tubes are locked in the open position when the detent assembly drops into the rectangular hole in the trigger housing assembly.

b. The fin stabilized rocket in this system contains a shaped charge warhead with a point initiating base detonating (PIBD) fuze. The fuze contains a 2-wire system from the piezo electric element on the warhead to the fuze detonator which provides electrical fuze initiation when the nose crystal is struck. In addition, the fuze has a mechanical inertial graze element as a secondary means of functioning.

Differences between Models:

The M72A2 rocket is similar to the M72A1 with the exception of the warhead which contains a precision shaped charge liner cone. This provides greater target penetration than the M72A1. There is also a minor change in the wiring between the piezo electric element and fuze, otherwise the two systems are identical. The M72A3 is similar to M72A2.

WARNING

Wear ear plugs when firing the weapon. The 100 and 150 meter markings on the front sight are coated with radioactive material, then laminated between two sheets of plastic. If sight is broken, remove and place in a plastic sealed bag. Return bag to ammunition disposal personnel.

Functioning:

a. Extending the launcher into the extended or firing position automatically locks the weapon.

b. After the trigger safety handle is released, the trigger is depressed. This releases the channel assembly which drives the firing pin into the primer of the rocket motor igniter. This ignites the black powder in the flash tube, which in turn, ignites the integral igniter of the rocket motor. The igniter initiates the propellant. The burning propellant propels the rocket from the launcher.

c. Upon target impact, the fuze train detonates the charge which collapses the copper liner into a finger shaped jet. The jet is preceded by extremely hot, high velocity gases which melt a hole in the target. The copper jet then penetrates into the target. Almost simultaneously the body

and ogive are blasted into small fragments by the detonated octol charge. These fragments travel adjacent to, and aft of the line of fire.

Tabulated Data:

LAW systems (packaged):

Models -----	M72A2
Weight -----	4.7 lb
Length:	
Closed	
position ---	25.77 in.
Extended	
position ---	35.16 in.
Launcher ---	M72
Weight -----	2.50 lb
Rocket -----	M72
Warhead---	M18A1
Fuze -----	M412A1
Motor -----	M54

Warheads:

Weight (loaded and fuzed) ---	2.3 lb
----------------------------------	--------

Explosive charge:

Type -----	60/40 octol
Weight -----	0.67 lb (304 g)
Body material-	Steel w/aluminum ogive
Color -----	Black w/yellow markings

Fuzes (integral):

Type -----	Point-initiating, base detonating
Weight -----	0.154 lb
Overall length (max) -----	1.89 in.
Diameter (max) -----	1.28 in.

Explosive
booster:

Type -----	Composition A5 (tetryl)
Weight -----	0.20 oz (5.6 g)
Arming distance -----	25 - 45 ft (7.6-13.7m)

Motor:

Weight ----- 0.67 lb

Propellant:

Model ----- M7

Type ----- Double base

Weight ----- 0.138 lb (62.7 g)

Configura-

tion ----- Stick

Number --- 19

Velocity ----- 475 fps (145 mps)

Thrust at

70°F ----- 4250 lb

Burning time - 7 to 15 milliseconds

Temperature

limits ----- -40° to +140°F

(-39.6° to 69.4°C)

Packing of**rocket in**launcher --- 5 per carton; 1 carton
per barrier bag; 3
barrier bags per wooden
box**Packing box:**

Weight

w/contents -- 117.7 lb

Dimensions -- 33-1/2 in. x 31-1/8 in.
x 13-3/4 in.Cube ----- 8.3 ft³**Shipping and storage data:**

Storage class/

SCG----- 1.1E

DOT shipping

class ----- A

DOT

designation -- ROCKET AMMUNITION
WITH EXPLOSIVE
PROJECTILE

Field storage- Group E

*DODAC ----- 1340-H553, 1340-H554,
1340-H555, 1340-H557
and 1340-H568**Drawings:**

Complete

assembly --- 10048503-M72

9210276-M72A1

9244054-M72A2

Loading ----- 9235663

Packing (inner)- 9227925

Packing (outer)- 9227926

References:

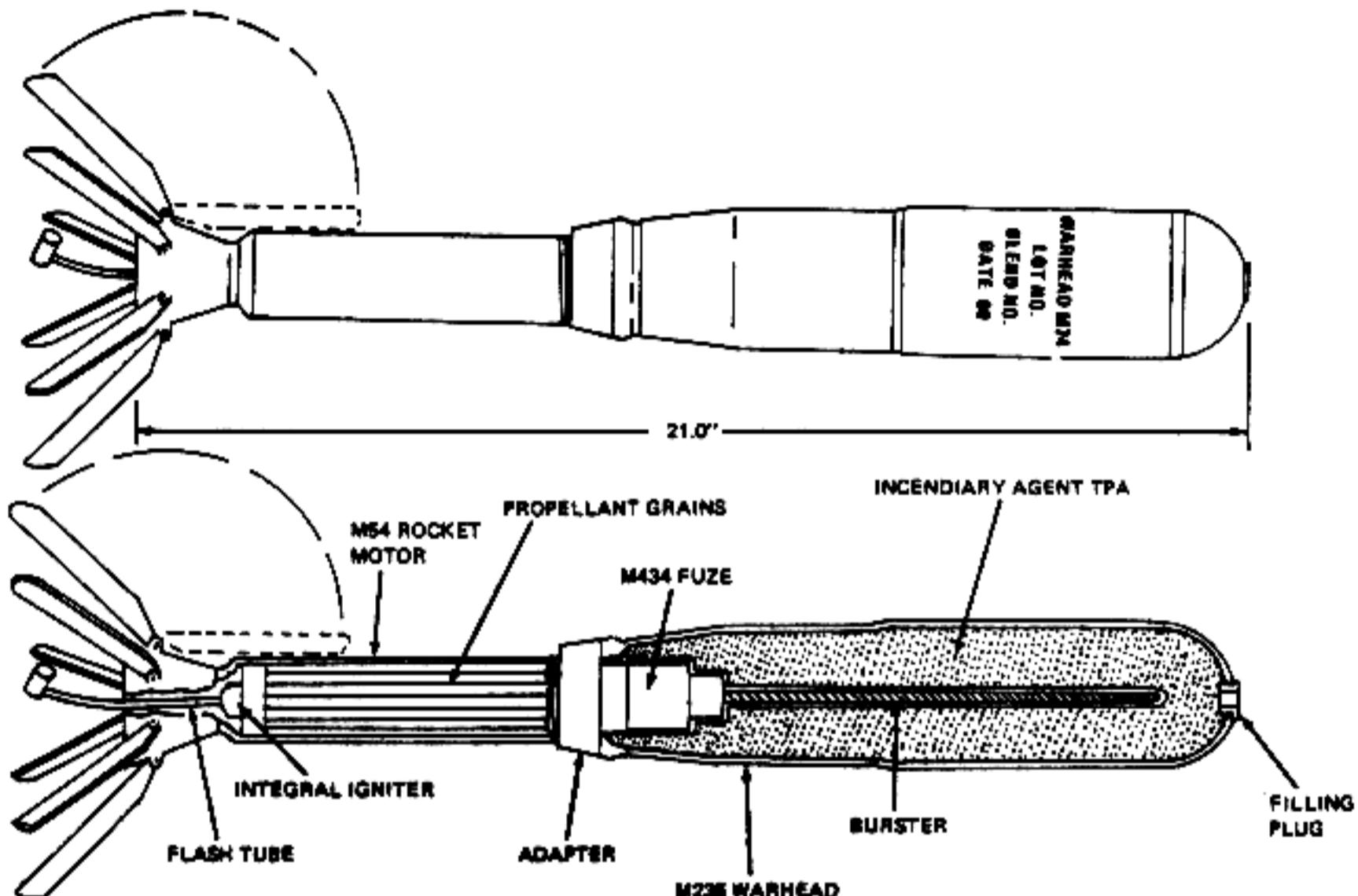
SC 1340/98-IL TM 9-1340-214-10

TM 9-1340-222-20

TM 9-1340-222-34 FM 23-33

*See appropriate supply catalog for individual NSN's pertaining to this (these) DODAC(s).

ROCKET, INCENDIARY, 66MM: TPA, M74



ARD80-0505

Type Classification:

STD (LCC-A) AMCTCM 9018 March 72

Use:

The M74 Incendiary triethylaluminum (TPA) is used to defeat or neutralize hard, soft, or jungle targets.

Description:

The M74 consists of a rocket warhead containing approximately 1.3 pounds of thickened TPA, a base detonating (BD) fuze and an adapter which adapts the rocket motor to the warhead. The rockets are issued in four round clips.

Functioning:

When the projectile is fired, acceleration acts upon the fuze sequential leaf arming mechanism. The fuze rotor assembly is then free to rotate to the armed position. When the rotor is in the armed position, the detonator is aligned with the remainder of the explosive train. Rocket deceleration, due to impact, causes the graze element of the fuze to shift, thereby allowing the firing pin of the fuze to be driven into the primer. The primer flashes through the flash channel and initiates the detonator, then the trademark in the warhead; disseminating the warhead agent.

Tabulated Data:

Rocket:

Model ----- M74
 Type ----- Incendiary
 Length ----- 21.0 in.
 Weight (approx) -- 2.95 lb

Performance:

Operating temper-
 ature limits ---- -40° to +140°F
 (-39.6° to 59.4°C)
 Range (max) ---- 825 yd (754 m)
 Range (min) ---- 22 yd (20 m)
 (hard targets)
 Muzzle velocity
 (approx) ----- 375 ft/sec

Burst radius
 (approx) ----- 65.5 ft (20 m)

Motor:

Model ----- M54
 Length ----- 9.2 in.
 Weight ----- 0.67 lb
 Thrust ----- 4250 lb

Propellant initiating
 train:

Igniter:
 Model ----- M56
 Type ----- Integral

Propelling charge:

Propellant ----- M7
 Type ----- Solvent
 Configuration --- Monoperforated cyl-
 indrical extruded
 grains (19)
 Weight ----- 0.138 lb
 Burning time --- 7 to 15 milliseconds
 Launcher ----- M202A1

Packing ----- Four per clip

Warhead:

Model ----- M235
 Type ----- Incendiary
 Color----- Red w/yellow
 markings
 Length ----- 11.60 in.
 Filler (warhead):
 Type ----- Triethylaluminum
 PyroPhoric (TPA)
 Weight ----- 1.3 lb (0.59 kg)

Fuze:

Model ----- M34
 Type ----- Base detonating

DODAC ----- 1340-H110

Shipping and storage
 data:

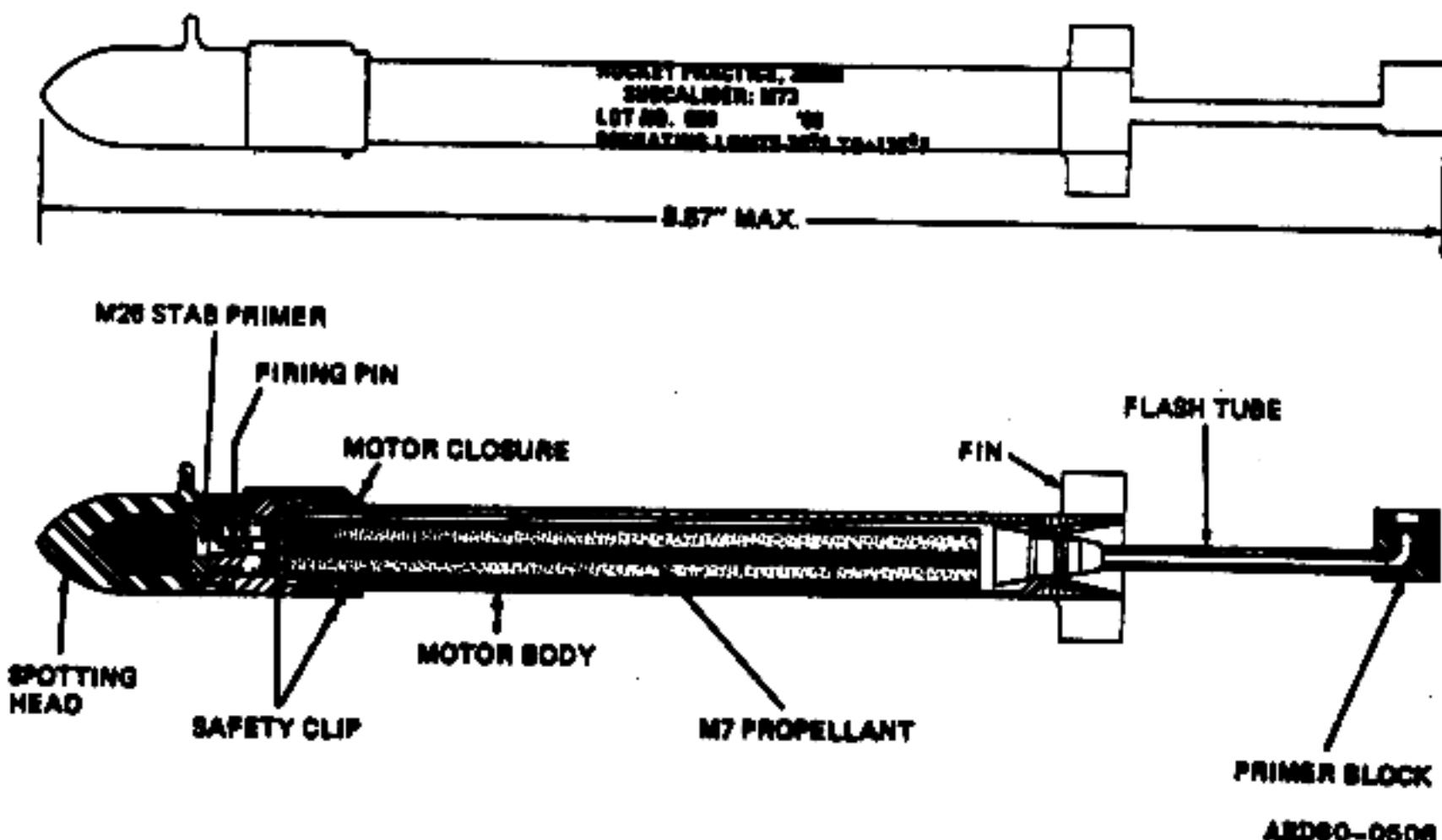
Storage class/
 SCG ----- 1.2L (12)
 DOT shipping
 class ----- A
 DOT
 designation ----- ROCKET
 AMMUNITION
 WITH INCENDIARY
 PROJECTILE

Field storage --- Group D

References:

TM 3-1055-218-12
 TM 3-1055-456-12
 Information on M96, four tube- CS
 clips used in the M202A1 launcher.

ROCKET, PRACTICE, 35MM, SUBCALIBER, M73

Type Classification:

STD (LCC-A) AMCTCM 7617 April 70

Use:

To train personnel in the operation and use of the 66-mm antitank rocket, M72 series.

Description:

a. The M190 subcaliber launcher with M73 subcaliber rocket can be used against all solid stationary or moving targets.

Together they can be used in all training phases, from fixed firing live to simulated situations, such as a "trainfire" type operation.

b. The M190 subcaliber launcher is a tubular, telescoping, smooth-bore, open-breech weapon.

c. The M73 subcaliber rocket consists of a spotting head, a motor closure, a rocket motor and an igniter assembly. The spotting head contains the same flash composition used in the M80 explosive simulator (TM 9-1370-203-34&P) to assist in locating

the fired rocket. The forward end of the motor closure provides a cavity that contains a base detonating fuze and a primer. The motor case contains tubular grains or propellant. The rocket is stabilized by six molded, plastic fins.

Differences between Models:

The external appearance of the M190 subcaliber is almost identical to the M72A1. The M190 differs from the tactical launcher M72A1 by having a subcaliber rocket and a quick release primer housing door to simplify reloading. The used M72A1 launcher is modified by use of a conversion kit to produce the M190 subcaliber launcher.

Functioning:

Extending the launcher into the extended or firing position automatically locks the weapon. After the trigger safety handle is released, the trigger can be depressed. This releases the channel assembly which drives the firing pin into the primer of the rocket motor igniter. This ignites the black powder in the flash tube, which, in turn, ignites the integral igniter of the rocket motor. The igniter initiates the propellant. The burning propellant propels the rocket from the launcher. When the spotting head of the rocket strikes a target, an inertia-driven firing pin sets off the primer. The primer in turn sets off the spotting head which produces a flash, noise and white smoke.

Tabulated Data:

Rocket:

Model -----	M73
Type -----	Practice
Weight -----	0.32 lb
Length -----	8.87 in.

Diameter -----	1.37 in.
Head:	
Material -----	Plastic
Type -----	Spotting
Charge:	
Flash	
composition --	0.05 oz (1.41 g)
Color-----	Black
Motor -----	Steel

Type of propellant:

Model -----	M7
Type -----	Double base
Weight -----	0.02 lb (9 g)
Configuration ---	Stick
Number -----	3

Fuze -----	Integral, base detonating
Primer -----	Stab, M26
Velocity at 70°F-	497 fps

Burning time

(max) -----	12 milliseconds
-------------	-----------------

Range -----	(55-354 yd) (50-325 m)
-------------	---------------------------

Temperature limits:

Firing -----	-10° to +135°F (-23.1° to +56.65°C)
--------------	--

Storage -----	-40° to +140°F (-39.6° to +59.4°C)
---------------	---------------------------------------

Launcher -----	M190
----------------	------

Packing -----	30 per fiber container; 3 containers per wooden box
---------------	---

Packing box:

Weight w/contents-	58.8 lb (26,460 g)
--------------------	--------------------

Dimensions -----	32-3/4 in. x 13-1/4 in. x 15-7/8 in.
------------------	--------------------------------------

Cube -----	4.0 ft ³
------------	---------------------

Shipping and storage data:

Storage class/	
----------------	--

SCG -----	1.2E (04)
-----------	-----------

Dot shipping	
--------------	--

class -----	A
-------------	---

DOT designation ----- ROCKET AMMUNITION WITH EXPLOSIVE PROJECTILE
*DODAC ----- 1340-H708
Drawings:
Complete assy ----- 10242725
Loading assy ----- 10242725
Packing (inner) ----- 10242743
Packing (outer) ----- 10242697

Information on SLUFAE mine neutralizing rockets, 115MM GB and VX rockets and the VIPER HEAT Rocket.

References:

SC 1340/98-IL
TM 9-1340-203-20

*See appropriate supply catalog for individual NSN's pertaining to this (these) DODAC(s).

CHAPTER 3
AIRCRAFT ROCKETS
2. 75-Inch

Complete Rounds:**Aircraft Rocket Launchers.**

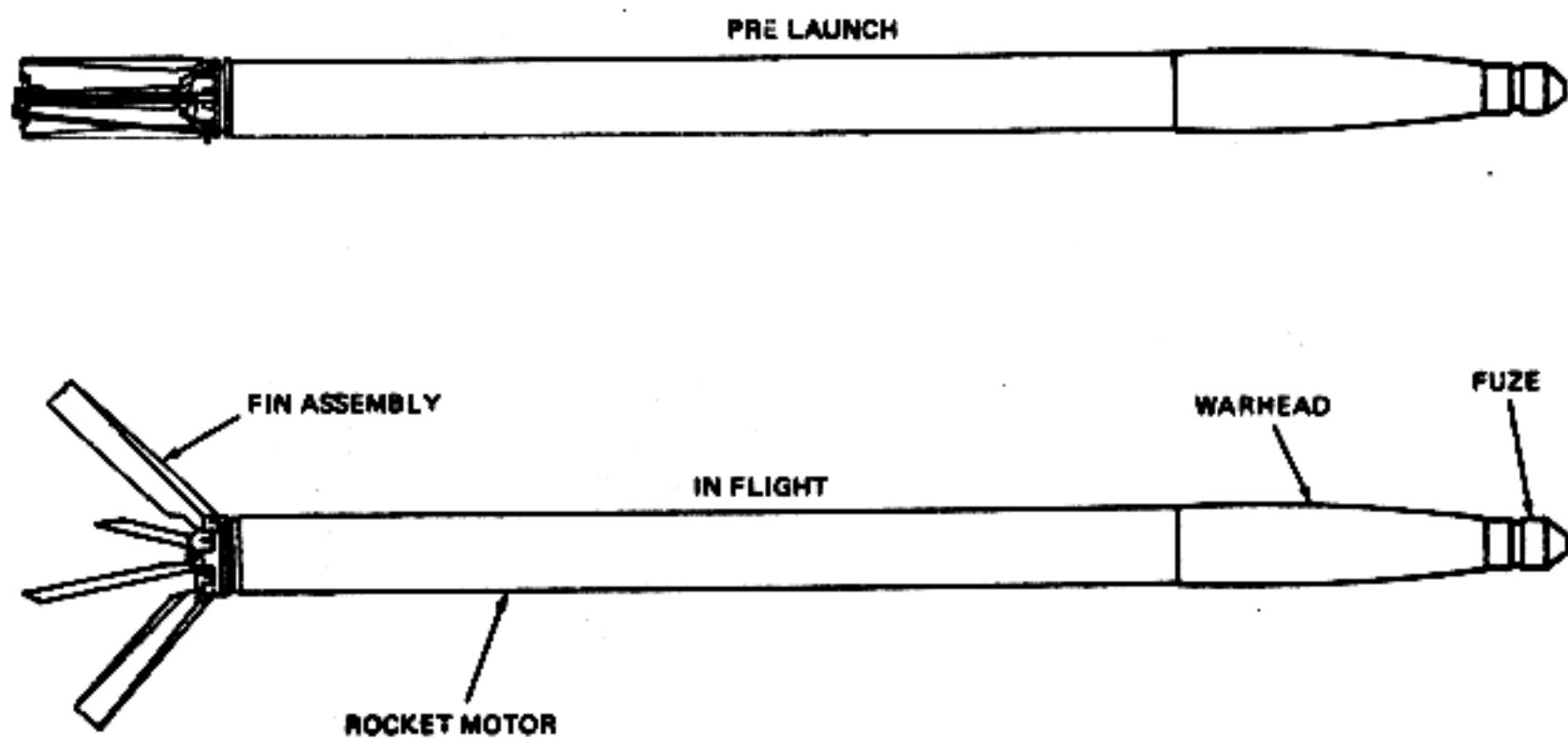
a. Complete rounds can be assembled in the combinations in table 3-1. They may be fired from the M157, M158, M159C, M3 or M200 2.75-Inch

b. The rockets can be issued unassembled. This chapter contains information pertaining to the components of the un-assembled rockets.

Table 3-1. 2.75-Inch Complete Round Rocket Combinations

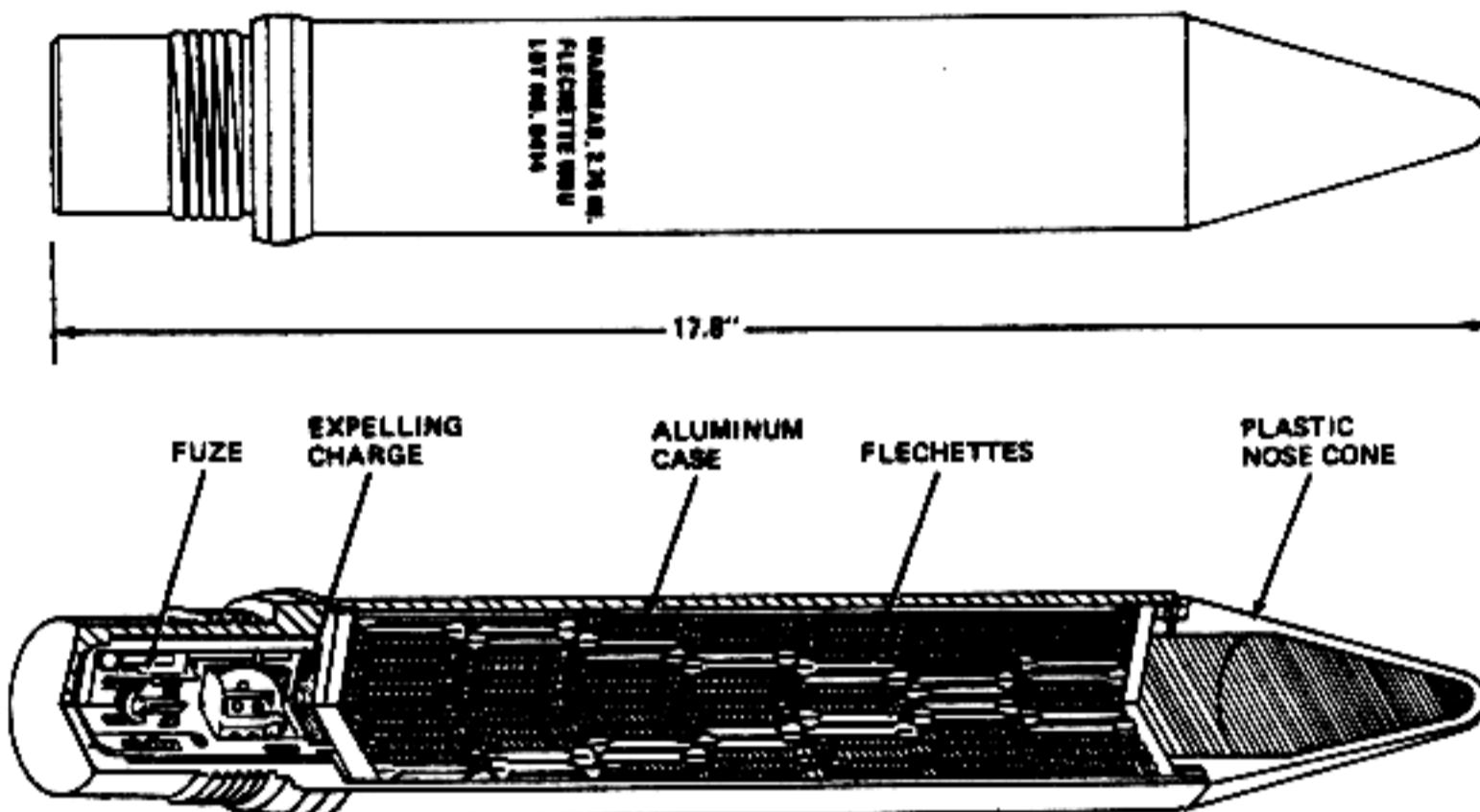
<u>DODAC</u>	<u>Warhead</u>	<u>Motor</u>	<u>Fuze</u>
1340-H459	Flechette (ANTIPERSONNEL) WDU/4A/A High Explosive M151	Mk40, Mod 3	Integral
1340-H470		Mk4, Mods	M427
1340-H471		Mk40, Mod 3	M433
1340-H489		Mk40, Mod 3	M429
1340-H490		Mk40, Mod 3	M423
1340-H161		Mk40, Mod 3	M423
1340-H485		Mk4, Mod 10	M427
	High Explosive M229		
1340-H488		Mk40, Mod 3	M429
1340-H533		Mk40, Mod 3	M427
1340-H534		Mk40, Mod 3	M423
1340-H160		Mk40, Mod 3	M423
1340-H469		Mk40, Mod 3	M433
	Smoke, WP, M156		
1340-H519		Mk40, Mod 3	M423
1340-H486		Mk 4, Mod 10	M427
1340-H593		Mk40, Mod 13	M427
1340-H826	HE, DP	Mk40, Mod 3	M438
			M247
1340-H828	Practice, WTU-1/B	Mk40, and Mods	None
1340-H180	Illuminating M257	Mk40	M442
1340-H116	Smoke, Screening WP, M259	Mk40, Mod 3	M446

TYPICAL 2.75-INCH AIRCRAFT ROCKET (LSFFAR)



ARD80-0508

ROCKET, FLECHETTE, 2.75-INCH, WDU-4A/A

Type Classification:

STD (LCC-A) AMCTCM 47560 Nov 69

Use:

The warhead contains flechettes and is used against personnel.

Description:

a. The complete round consists of a warhead with an integral fuze and rocket motor.

b. The warhead consists of 3 main parts: a nose section, a body, and an integral fuze. The nose section, a plastic cone bonded to a metal plate, is attached to the body by shear pins. The body is a

hollow cylinder loaded with 20 grain flechettes. The most recently manufactured WDU-4A/A warheads contain three tracers for the purpose of assisting the pilot/gunner in identifying the beaten zone of the flechette impact pattern. Two semicylindrical sleeves retain the flechettes in place. A metal pusher plate is located just aft of the flechettes. The threaded end of the body is machined internally to accommodate a base-detonating (BD) fuze.

c. The low-spin folding-fin aircraft rocket (LSFFAR) is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. However, it is also used on Air Force and Navy jet aircraft in ripple fire and in a restricted single fire mode.

d. The rocket motor is described in Chapter 5.

Differences between Models:

The Mk 40 Mods 1 and 3 have integral bulkhead motor tubes whereas the Mk 40 Mod 0 has nonintegral bulkhead tube. The igniter of the Mod 3 motor differs from that of the Mods 0 and 1 motors in that the igniter has been modified to incorporate a carried, frangible case in lieu of the blow-out plug. Also, the squib is located on the periphery instead of the center of the case.

Functioning:

a. The rocket motor functions when current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge which ignites the propellant grain. Combustion gases from the burning propellant pressurizes the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

b. Functioning of the fuze sets off an expelling charge which forces the pusher plate, flechettes and semicylindrical sleeves forward. This shears the pins attaching the nose cone to the body and expels the flechettes into the slipstream ahead of the rocket.

Tabulated Data:

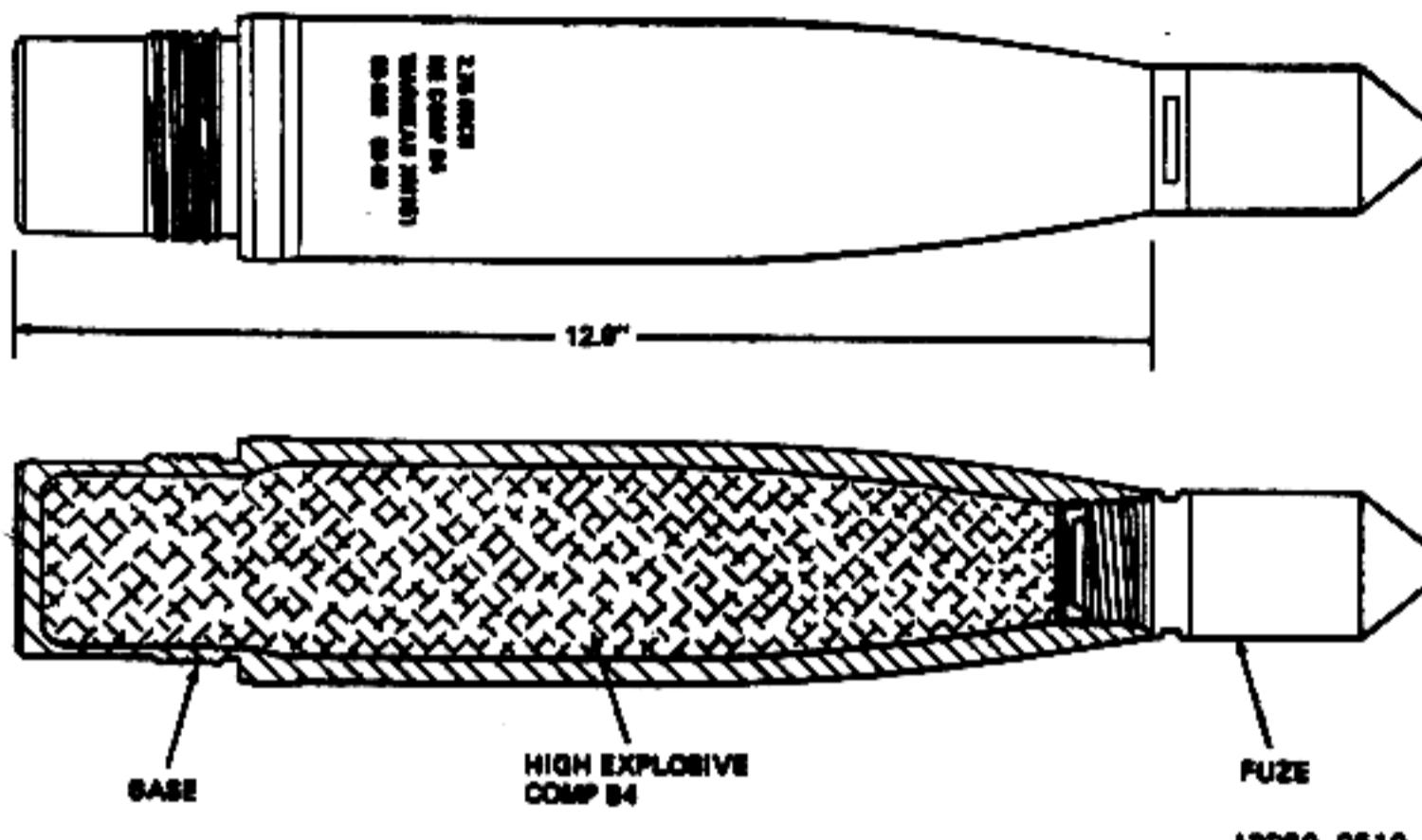
Type -----	Antipersonnel
Weight (fuzed) ---	9.3 lb
Length -----	17.8 in.
Filler:	
Type -----	20-grain flechettes
Number -----	2200
Weight -----	6.3 lb
Body material ---	Extruded aluminum

Fuze -----	Integral
Type -----	Base detonating
Length -----	3.30 in.
Diameter -----	2.55 in.
Sensitivity -----	15 G's or less
Arming distance-	(47-100 yd) (43 - 92 m)
Setback to arm--	28 G's approx
Color-----	Olive drab w/white markings
Temperature limits:	
Firing -----	-40° to +140°F (-39.6° to +59.4°C)
Storage -----	-40° to +140°F (-39.6° to +59.4°C)
Drawing number---	D67D9700
Packaging for com- plete round -----	1 rocket consisting of warhead, WDU- 4A/A and rocket motor Mk 40, 3 per fiber container; 4 containers per wooden box
Packing box:	
Weight (w/ contents -----	162 lb
Dimensions -----	62-13/16 in. x 8-11/16 in. x 9-1/2 in. (cm)
Cube -----	3.5 ft ³
Shipping and storage data:	
Storage class/	
SCG -----	1.2C (12)
DOT shipping class -----	B
DOT designation -----	ROCKET AMMUNI- TION WITH INERT LOADED PROJEC- TILE
Field storage ---	Group F
DODAC for complete round -----	1340-H459

Rocket Motor:

Model ----- Mk 40, Mod 3
Length (overall) -- 39.9 in.

ROCKET, HIGH-EXPLOSIVE, 2.75-INCH W/M151 WARHEAD

Type Classification:

STD (LCC) AMCTCM 3990, 3233 and
5178 Oct 65

Use:

This is a general purpose high-explosive rocket that can be presently assembled in five different combinations of motors and fuzes.

Description:

a. This low-spin folding-fin aircraft rocket (LSFFAR) is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It is also used on Air Force and Navy jet aircraft in ripple fire and in a restricted single-fire mode.

b. The warhead consists of two main parts, a nose and a base, brazed together.

The nose section is threaded to receive a fuze. The base is made of steel and is threaded for attachment to rocket motor.

c. Fuzes assembled with 2.75-in. rockets are classified as point detonating (PD), or proximity, according to the manner in which they are initiated. Except for the Proximity Fuze M429, these fuzes are nondelay and super-quick. The point detonating fuses and proximity fuses are threaded into the forward end of the high explosive warhead.

d. The M151 warhead is available with fuzes M423, M427, M429, and M433. These fuzes differ from each other functionally and have the following characteristics:

- M423) Oblique impact sensitive, point-
- M427) detonating, super-quick type fuze.

M429 Transistorized Doppler type proximity fuze with a super-quick impact switch as a backup.

M433 A resistance-capacitance multi-option time delay fuze with selectable functioning modes for jungle canopy penetration, bunker penetration and super-quick for open terrain.

e. The Mk 40 low-spin folding-fin aircraft rocket motors are fin stabilized and have scarfed nozzles. The scarfed nozzles give low spin to the rocket and provide the additional stability required for deployment from low speed aircraft.

f. The rocket motor is described in Chapter 5.

Differences between Models:

The table below identifies the differences between the high-explosive M151 warhead incorporated within the approved configurations of motor and fuze.

Functioning:

a. Fuze Functioning

(1) A typical PD fuze (M423 and M427) arms under minimum, sustained acceleration. On impact with the target, the nose of the fuze is crushed and the firing pin strikes the primer. Primer detonation sets off, in sequence: the detonator, the booster lead-in, the booster, and the explosive in the warhead.

(2) The M433 fuze is an electronic multi-option delay time delay fuze with selectable functioning modes for forest canopy penetration, bunker structure penetration and super-quick (SQ) for open terrain. The fuze body is steel. A forest canopy switch extends from the nose of the fuze to signal to the fuze electronic circuit when first contact is made with the tree tops. An umbilical assembly is positioned at the nose of the fuze for electrical connection to the M132 fuze safety and timing device located in the helicopter. Internally, the fuze consists

<u>DODAC</u>	<u>Warhead</u>	<u>Motor</u>	<u>Fuze</u>
1340-H470	High-Explosive M151	Mk 40, Mods 1, 3	M427
1340-H471		Mk 40, Mod 3	M433
1340-H489		Mk 40, Mods 1, 3	M429
1340-H490		Mk 40, Mods 0, 1, 3	M423
1340-H161		Mk 40, Mod 3	M423
1340-H485		Mk 4, Mod 10	M427

of a Resistance Capacitance (RC) electronic time circuit, a safing and arming mechanism with an electrical M84 detonator and a booster assembly.

(3) The M433 fuze has a selectable time delay range that depends on the height of the forest canopy (40 to 130 feet). After first contact with the tree tops, a delay timer is activated which results in warhead functioning beneath the canopy, but above ground level. The bunker structure penetration mode is incorporated into the fuze to defeat the medium hardness targets constructed of logs, earth, bricks, etc. The fuze can be set from the cockpit for penetrating up to 10 ft of protection and destroying the target from within. The hard target penetration RC timer is activated by inertial switch sensing, setback in excess of 1000 G's. Also, an SQ point detonating feature is included to provide operational flexibility in open terrain. This mode is achieved by setting delay to zero. First contact with any surface detonates the round.

(4) The M433 has no internal battery. Required voltage is supplied by the aircraft via the M132 safety and timing device 160 milliseconds prior to the rocket being fired. During this 160 millisecond period, fuze is charged to give time delay selected by pilots.

(5) The M433 fuze is to be used with M151 warheads.

(6) The M429 proximity fuze is a completely transistorized, continuous wave, doppler device to provide airburst characteristics. It was designed primarily for use with high-explosive (HE) warheads for improved anti-personnel lethaliies.

(7) A super-quick impact switch serves as a backup in the event of failure

of the airburst electronics. The arming mechanism is similar to that contained in the M427 fuze except that it has been modified to include an electric detonator as well as a battery starter assembly to initiate an electric battery. An electric detonator is assembled in the rotor. A plastic (lexan) sleeve houses the thermal battery which is located directly above the safety and arming device (S&A) mechanism.

(8) Testing against 3 ft thick wood barriers indicates warhead detonations may occur 6-in. prior to exit from the barrier to as much as 4.5 ft into the bunker void.

(9) The nose cap is designed to provide fuze sensitivity on oblique/graze impacts. With the cap removed and the fuze set in the delay mode, oblique/graze impact sensitivity is obtained through the inertial action of the firing pin.

(10) Because of the void sensing characteristics of the fuze, complete destruction may be anticipated when a target hit is achieved. It is recommended that rockets be fired in pairs at minimum ranges and steep dive angles to enhance target hits.

b. Rocket Functioning. When the rocket is launched, with point detonating fuze (PD) it becomes armed from inertial forces resulting from sustained acceleration. This frees the unbalanced rotor to turn and lock the explosive train in the armed position. Upon impact with a target, the detonator functions and initiates the explosive train.

Upon detonation, the warhead shatters into thousands of small, high-velocity fragments.

Tabulated Data:

Warhead model ---- M151
 Type ----- High explosive
 Weight (fuzed) ---- 8.7 lb
 Length (w/o fuze)--- 12.9 in.

Filler:

Type ----- Comp B4
 Weight ----- 2.3 lb (1.04 kg)
 Body material ---- Pearlitic or ferritic
 malleable iron
 Color----- Olive drab, yellow
 markings

Temperature limits:

Firing ----- -65° to +150°F
 (-53.35° to +64.9°C)
 Storage ----- -65° to +150°F
 (-53.35° to +64.9°C)

Drawing number --- 8882186

Packing for complete
 round ----- 1 rocket consisting
 of Warhead, HE,
 M151 with Rocket
 Fuze, M423 or
 M427 with Mk 4
 motor only and
 motor Mk 40, Mod
 0, 1 or 3 per fiber
 container; 3, 4 or
 25 containers per
 wooden box

Packing box:

Weight w/contents - 127 lb
 Dimensions ----- 62-13/16 in. x
 8-11/16 in. x
 9-1/2 in.

Cube ----- 3.6 ft³

Shipping and storage data:

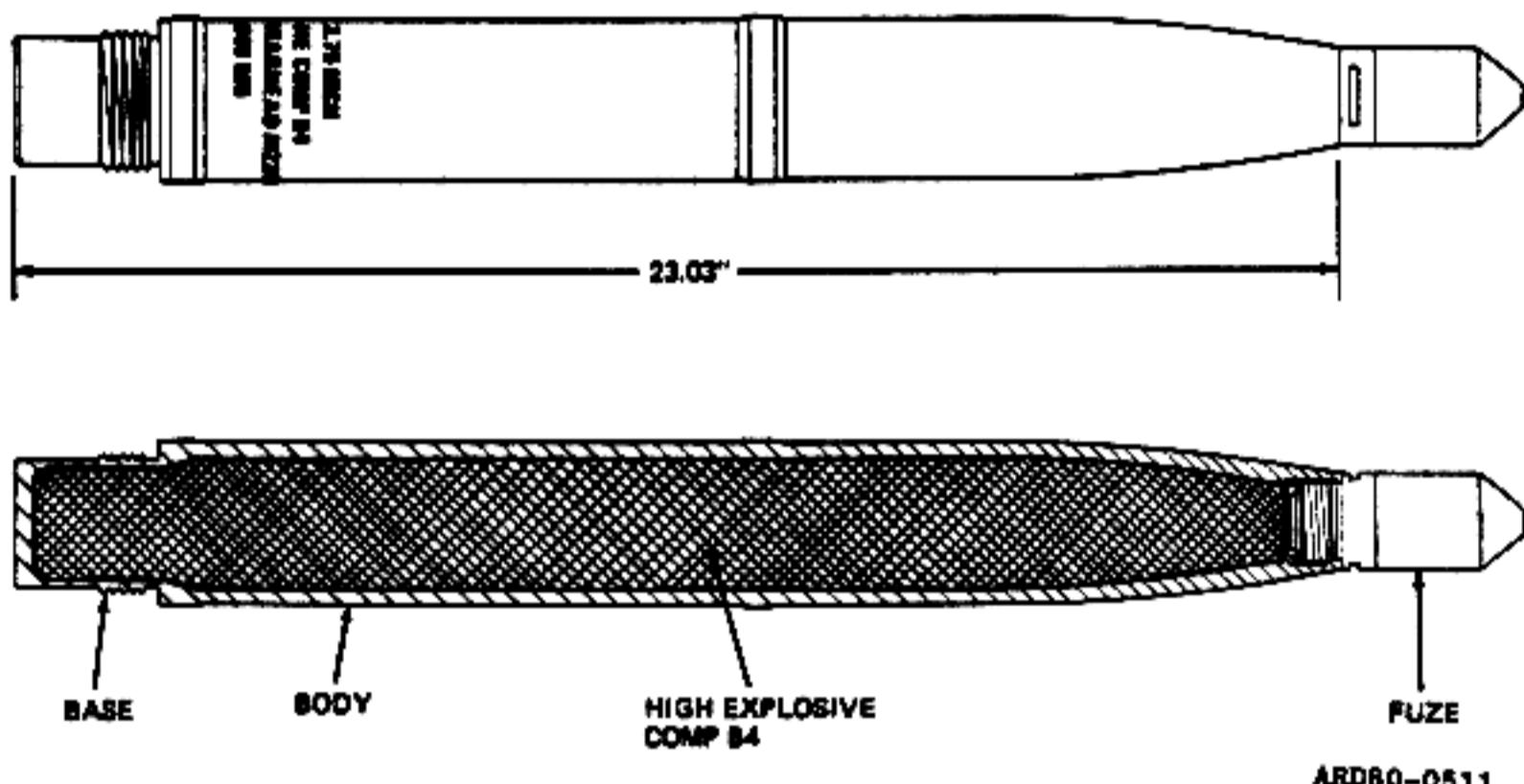
Storage class/
 SCG ----- 1.1E
 DOT shipping
 class ----- A
 DOT
 designation ----- ROCKET AMMU-
 NITION WITH
 EXPLOSIVE
 PROJECTILES
 Field storage --- Group F
 *DODAC ----- 1340-H470, 1340-
 H471, 1340-H489,
 1340-H490, 1340-
 H491, 1340-H485
 Drawing numbers --- 9220807, 9204528,
 9209570, 9235961,
 8796521, 9230114,
 8796522

References:

TM 9-1340-222-20
 TM 9-1340-222-34
 SC 1340/98-IL

*See appropriate supply catalog for individual NSN's pertaining to this (these) DODAC(s).

ROCKET, HIGH-EXPLOSIVE, 2.75-INCH W/M229 WARHEAD

Type Classification:

STD AMCTCM or OTCM 8685

Use:

To provide improved aerial artillery capability for the 2.75-in. rocket.

Description:

a. This low-spin folding-fin aircraft rocket (LSFFAR) is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It is also used on Air Force and Navy jet aircraft in ripple fire mode. Nozzles are scarfed to produce the low rate of spin required for deployment at low speeds.

b. This rocket is used to enhance the lethality and destructiveness of the 2.75-in. rocket in its aerial artillery role. It uses the M229 warhead which is an elongated version of the M151 warhead, and is commonly referred to as the 17-lb warhead.

c. It consists of three main parts consisting of the nose, body, and base. The three main parts are welded together. There is an alternate two-piece design consisting of a one-piece nose body plus a base.

d. Fuze assembled with 2.75-in. rockets are classified as point detonating (PD), or proximity, according to the manner in which they are initiated. Except for the Proximity Fuze M429, these fuzes are

nondelay and super-quick. The point detonating fuzes and proximity fuze are threaded into the forward end of the high explosive warhead.

e. The M229 warhead is available with fuzes M423, M427, M429 and M433. These fuzes differ from each other functionally and have the following characteristics:

- M423) Oblique impact sensitive, point-detonating, super-quick type fuze.
- M427) Transistorized Doppler type proximity fuze with a super-quick impact switch as a backup.
- M429 A resistance-capacitance multi-option time delay fuze with selectable functioning modes for jungle canopy penetration, bunker penetration and super-quick for open terrain.

f. The rocket motor is described in Chapter 5.

Differences between Models:

a. The nose and base of the M229 warhead are essentially identical to the M151

parts, which are separated by the 10-in. long cylindrical body.

b. The table below identifies the differences between the high-explosive M229 warhead incorporated within the approved configurations of motor and fuze.

Functioning:

a. Ignition. Functioning of the 2.75-in. rocket with an M229 warhead begins when the firing circuit switch is closed. Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge, which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

b. Fin Operation. The thrust of the nozzle exhaust blows off the fin retainer and releases the fins. Upon clearing the launcher, the fins are opened by the force of the fin actuating piston pushing on the heels of the fins. The fins are held by the crosshead of

<u>DODAC</u>	<u>Warhead</u>	<u>Motor</u>	<u>Fuze</u>
	<u>High Explosive M229</u>		
1340-H469		Mk40, Mod 3	M433
1340-H488		Mk40, Mods 1, 3	M429
1340-H533		Mk40, Mods 1, 3	M427
1340-H534		Mk40, Mods 1, 3	M423
1340-H160		Mk40, Mod 3	M423

the piston at an angle of 45 degrees with the axis of the motor tube.

c. Fuze Functioning.

(1) The M429 proximity fuze is a completely transistorized, continuous wave, with doppler device to provide airburst characteristics. It is designed primarily for use with HE warheads for improved anti-personnel lethali-

(2) A super-quick impact switch in the M429 serves as a backup in the event of failure of the airburst electronics. The arming mechanism is similar to that contained in the M427 fuze except that it has been modified to include an electric detonator as well as a battery starter assembly to initiate an electric battery. An electric detonator is assembled in the rotor. A plastic (lexan) sleeve houses the thermal battery which is located directly above the S&A mechanism.

(3) When the rocket is launched, the fuze becomes armed from inertial forces resulting from sustained acceleration. This frees the unbalanced rotor to turn and lock the explosive train in the armed position. Upon sensing a target, the detonator is fired and initiates the explosive train.

Upon detonation, the warhead shatters into thousands of small high-velocity fragments.

Tabulated Data:

Warhead model --- M229
 Type ----- High explosive
 Weight (fuzed) --- 18.1 lb
 Length (w/o fuze) -- 23.03 in.

Filler:

Type ----- Comp B4
 Weight ----- 4.8 lb (2.18 kg)
 Color ----- Olive drab/yellow markings

Temperature limits:

Firing ----- -65° to +150°F
 (-53.35° to +64.9°C)
 Storage ----- -65° to +150°F
 (-53.35° to +64.9°C)

Packing ----- 1 per fiber container; 4 containers per wooden box

Drawing number --- 9218698

Packing for complete round ----- 1 rocket consisting of warhead, HE, M229 w/rocket fuze and rocket motor per fiber container; 3, 4 or 25 containers per wooden box

Packing box:

Weight
 w/contents ----- 162 lb
 Dimensions ----- 72-13/16 in. x 8-11/16 in. x 9-1/2 in.

Cube ----- cm³
 3 ft³

Shipping and storage

data:

Storage class/
 SCG ----- 1.1E
 DOT shipping class -A
 DOT designation -- ROCKET AMMUNITION WITH EXPLOSIVE PROJECTILES

Field storage --- Group F

*DODAC ----- 1340-H469, 1340-H488, 1340-H533, 1340-H534, 1340-H160

Drawing number --- 9220806

References:

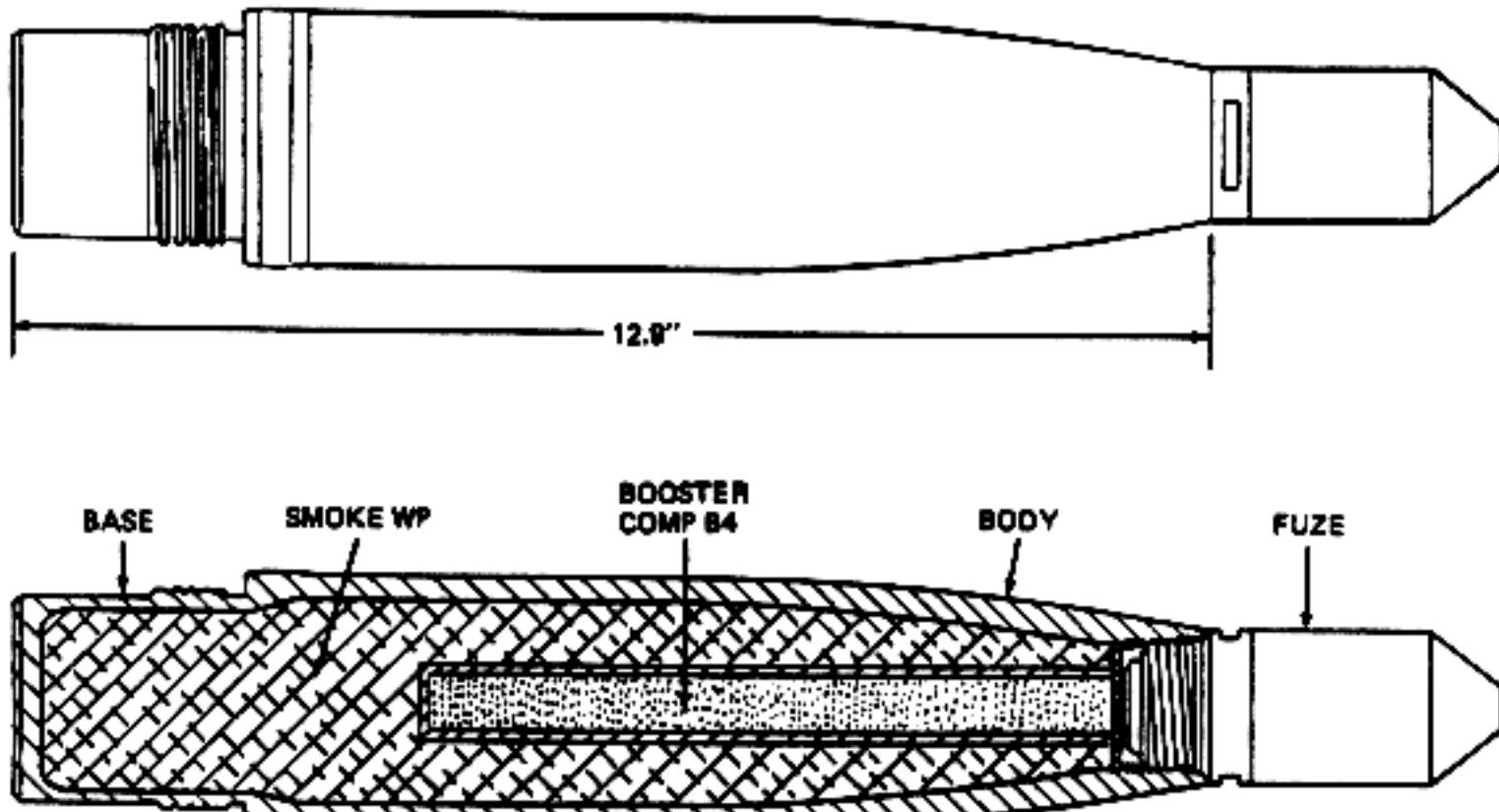
TM 9-1340-222-20

TM 9-1340-222-34

SC 1340/98-IL

*See appropriate supply catalog for individual NSN's pertaining to this (these) DODAC(s).

ROCKET, SMOKE, WP, 2.75-INCH W/M156 WARHEAD



ARD80-0512

Type Classification:

STD AMCTCM 10766032

Use:

Primarily to provide smoke for target marking and incendiary purposes.

Description:

a. This warhead is a ballistic match for high explosive (HE) Warhead M151. The M156 consists of a steel body, a base, and an adapter, brazed together. The body is shaped at the forward end to form the ogive. The base is an extruded steel cup threaded for attachment to the rocket motor. The steel adapter, at the forward end of the warhead, is threaded to receive the fuze. It also serves to retain the burster charge tube.

b. The fuzes assembled in this 2.75-in. rocket are classified as point detonating (PD), or proximity, according to the manner in which they are initiated. Except for the Proximity Fuze M429, these fuzes are nondelay and super-quick. The point detonating fuzes and proximity fuze are threaded into the forward end of the warhead.

c. The WP M156 warhead is available with fuzes M423, M427, and M429. These fuzes differ from each other functionally and have the following characteristics:

- | | |
|-------|--|
| M423) | Oblique impact sensitive, point-detonating, super-quick type fuze. |
| M427) | Transistorized Doppler type proximity fuze with a super-quick impact switch as a backup. |
| M429 | Transistorized Doppler type proximity fuze with a super-quick impact switch as a backup. |

d. The LSFFAR 2.75-in. rocket motors are fin stabilized and have scarfed nozzles. The scarfed nozzles give low spin to the rocket and provide the additional stability required for deployment from low speed aircraft.

e. The rocket motor is described in Chapter 5.

Differences between Models:

The table below describes the differences between the WP smoke M156 warhead incorporated within the approved configurations of motor and fuze.

Functioning:

a. Ignition. Functioning of the 2.75-in. rocket with an M156 warhead begins when the firing circuit switch is closed. Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge, which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

b. Fin Operation. The thrust of the nozzle exhaust blows off the fin retainer and releases the fins. Upon clearing the launcher, the fins are opened by the force

of the fin actuating piston pushing on the heels of the fins.

c. Fuze Functioning:

(1) A typical point detonating (PD) fuze (M423 and M427) arms under minimum, sustained acceleration. On impact with the target, the nose of the fuze is crushed and the firing pin strikes the primer, initiating the explosive train.

(2) The M429 proximity fuze is a completely transistorized, continuous wave, doppler device to provide airburst characteristics. It is designed primarily for use with HE warheads for improved anti-personnel lethality. A super-quick impact switch serves as a backup in the event of failure of the airburst electronics. The arming mechanism is similar to that contained in the M427 fuze except that it has been modified to include an electric detonator as well as a battery starter assembly to initiate an electric battery. An electric detonator is assembled in the rotor. A plastic (lexan) sleeve houses the thermal battery which is located directly above the safety and arming device (S&A) mechanism.

Tabulated Data:

Warhead model --	M156
Type -----	Smoke, WP
Weight (fuzed) ---	9.7 lb
Length (w/o fuze) -	12.9 in.

DODAC

Warhead

Smoke WP M156

1340-H472
1340-H519
1340-H486
1340-H593

Motor

Fuze

Mk40, Mod 3	M429
Mk40, Mod 0, 3	M423
Mk4, Mod 10	M427
Mk40, Mod 0, 3	M427

Filler:

Type -----	White phosphorous
Weight -----	2.2 lb (999 g)

Burster charge:

Type-----	Comp B
Weight -----	0.12 lb (54.5 g)

Body material --- Steel tubing

Color ----- Light green; yellow marking, yellow band

Temperature limits:

Firing -----	-40° to +165°F (-39.6° to +73.15°C)
Storage -----	-40° to +140°F (-39.6° to +59.4°C)

Packing ----- 1 per fiber container;
4 or 25 containers per wooden box

Drawing number --- D90-1-44

Packing for complete round ----- 1 rocket consisting of Warhead, Smoke, WP, M156 with rocket fuze and motor per fiber container; 4 containers per wooden box

Packing box:

Weight -----	162 lb
Dimensions -----	72-13/16 in. x 8-11/16 in. x 9-1/2 in.
Cube -----	3.5 ft ³

Shipping and storage data:

Storage class/	
SCG -----	1.2H (12)
DOT shipping class -----	A
DOT designation --	ROCKET AMMUNITION WITH SMOKE PROJECTILES
Field storage -----	Group D
*DODAC -----	1340-H472, 1340-H519, 1340-H486, 1340-H593

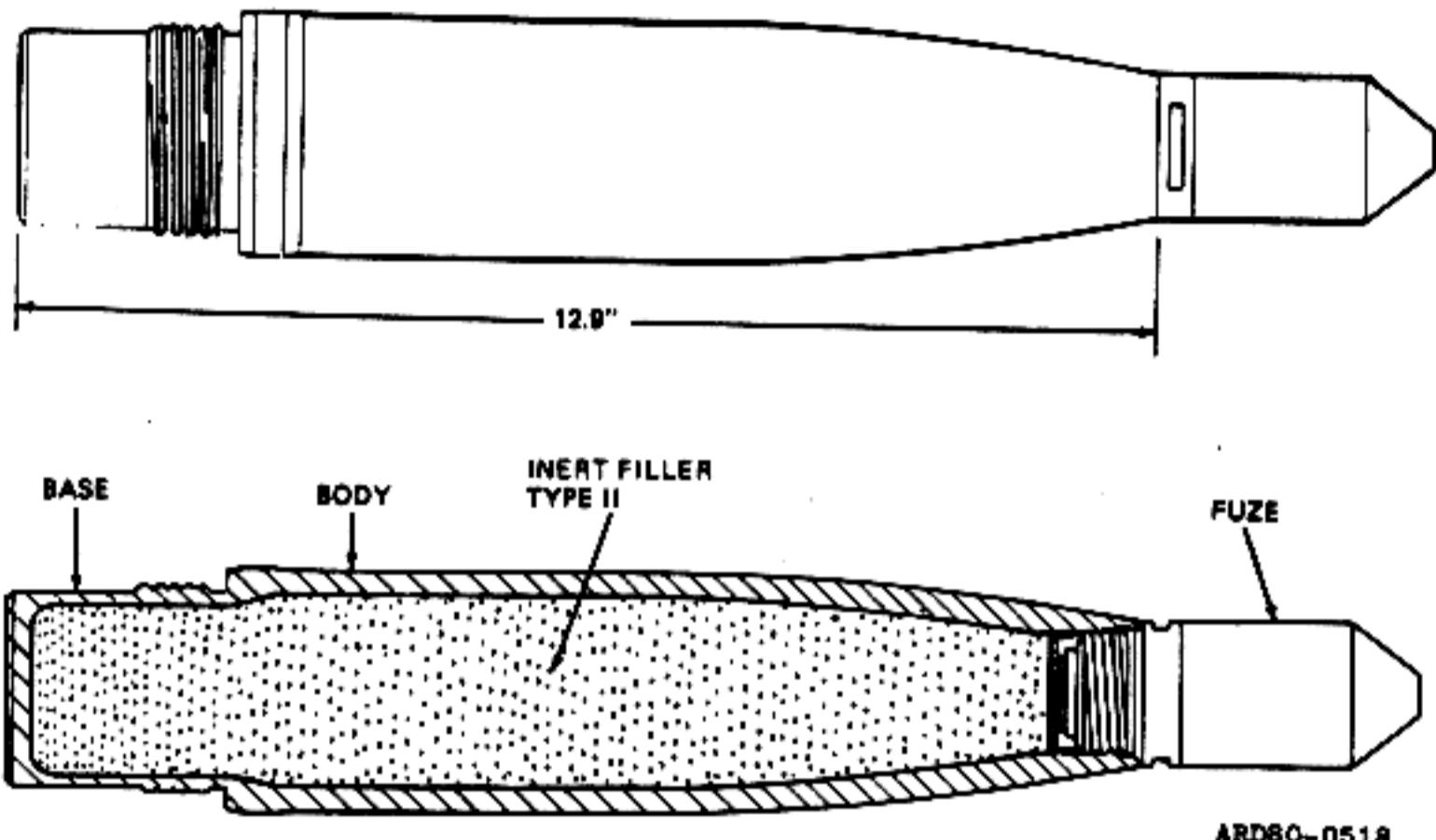
Drawing number --- 9252330, 9242567

References:

TM 9-1340-222-20
TM 9-1340-222-34
SC 1340/98-IL

*See appropriate supply catalog for individual NSN's pertaining to this (these) DODAC(s).

ROCKET, PRACTICE, 2.75-INCH W/M230 WARHEAD



ARD80-0518

Type Classification:

STD AMCTCM or OTCM 9153

Use:

This warhead is used for training and testing purposes.

Description:

a. This low-spin folding fin aircraft rocket is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It is also used on Air Force and Navy jet aircraft in ripple fire and in a restricted single fire mode. The nozzles are scarfed to produce the low rate of spin required for deployment at low speeds.

b. The warhead consists of two main parts, a nose and a base, brazed together. The nose section is threaded to receive a fuze. The base is made of steel, or cast iron and is threaded for attachment to rocket motor.

c. Fuze M435 is an inert fuze. It simulates point detonation fuses M423 and M427 generally in length, weight and configuration. It is made entirely of aluminum.

d. The LSFFAR 2.75-in. rocket motors are fin stabilized and have scarfed nozzles. The scarfed nozzles impact low spin to the rocket and provide the additional stability required for deployment from low speed aircraft.

e. The motors are composed of the following subassemblies and components.

(1) Motor tube and head closure assembly. Integral and non-integral bulkhead tubes are used with the rocket motors. The forward end of the motor tube is internally threaded to accommodate the warhead. The integral bulkhead motor tube has the motor tube and head closure formed in one piece by impact intrusion. It has no blowout disk. The non-integral bulkhead motor tube is made of aluminum alloy. The motor head is closed at the aft end by a thin scored disk. The disk functions as a blowout diaphragm.

(2) Propellant grain and associated fittings. The propellant grain is internally burning grain. It is inhibited on both ends and spirally wrapped with inhibiting tape along the external surface.

(3) Igniter. The igniter Mk 125 contains one electrical squib. Current passing through the squib bridgewire generates the heat necessary to ignite the squib mix which in turn ignites the powder in the igniter.

(4) Nozzle and fin assembly. The nozzle and fin assembly consists of a nozzle assembly (one nozzle plate, four inserts, and seals or a burst diaphragm), a fin-actuating mechanism, four fins and a fin retainer. It is attached to the aft end of the motor tube by a lockwire. Older motors have stepped-end lockwires; on new production items, the stepped-end has been eliminated.

Differences between Models:

The Mk 40 Mods 1 and 3 have integral bulkhead motor tubes whereas the Mk 40 Mod 0 has a non-integral bulkhead tube.

The igniter of the Mod 3 motor differs from that of the Mods 0 and 1 motors in that the igniter has been modified to incorporate a carried, frangible case in lieu of the blowout plug and the squib is located on the periphery of the case instead of the center of the case. The M230 has the same configuration, weight and center of gravity as the M151 warhead. Standard M151 metal parts are filled with an inert filler material having the same density as Composition B4 to manufacture this warhead.

Functioning:

a. Ignition. Functioning of the 2.75-in. rocket with an M230 warhead begins when the firing circuit switch is closed. Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge, which ignites the propellant grain. Combustion gases from the burning propellant pressurizes the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

b. Fin Operation. The thrust of the nozzle exhaust blows off the fin retainer and releases the fins. Upon clearing the launcher, the fins are opened by the force of the fin actuating piston pushing on the heels of the fins. The fins are held by the crosshead of the piston at an angle of 45° with the axis of the motor tube.

c. Fuze Functioning. The rocket fuze M435 is entirely inert.

d. Rocket Functioning. The warhead is entirely inert and is used for practice only.

Tabulated Data:

Warhead model ---- M230
 Type ----- Practice
 Weight (fuzed) ---- 9.4 lb
 Length (w/o fuze) --- 12.9 in.
Filler:
 Type ----- Inert material
 Weight ----- 2.3 lb (1044 g)
Body material ---- Iron
Color ----- Blue w/white markings
Fuze ----- M435
***DODAC (fuze)** ----- 1340-J318
Packing box:
 Weight
 w/contents ----- 127 lb
 Dimensions ---- 62-13/16 in. x 8-11/16 in. x 9-1/2 in.
 Cube ----- 3.5 ft³
Shipping and storage data:
 Storage class/
 SCG ----- 1.2C (12)
 DOT shipping
 class ----- B
 DOT
 designation ----- ROCKET AMMUNITION WITH INERT LOADED PROJECTILES
Field storage --- Group B
DODAC ----- 1340-H828
Drawing number --- 9242550
Temperature limits:
 Firing ----- -65° to +150°F
 (-53.35° to +64.9°C)
 Storage ----- -65° to +150°F
 (-53.35° to +64.9°C)
Packing ----- 1 per fiber container;
 4 containers per wooden box

Packing box:

Weight
 w/contents ----- 59.0 lb
 Dimensions ----- 20-13/16 in. x 8-1/4 in. x 9-3/32 in.)
 Cube ----- 0.9 ft³
Shipping and storage data:
 Storage class/
 SCG ----- N/A
 DOT shipping
 class ----- N/A
 DOT designation -- NON-EXPLOSIVE AMMUNITION
 Field storage ----- N/A
***DODAC** ----- 1340-H831
 Drawing number ---- 9221050
Packing for complete round ----- 1 rocket consisting of Warhead, M230 w/Fuze M435 and Rocket Motor Mk 40, Mod 1 per fiber container; 4 containers per wooden box

Motor (Mk 40 Mod 3) - 9220803

Packing:

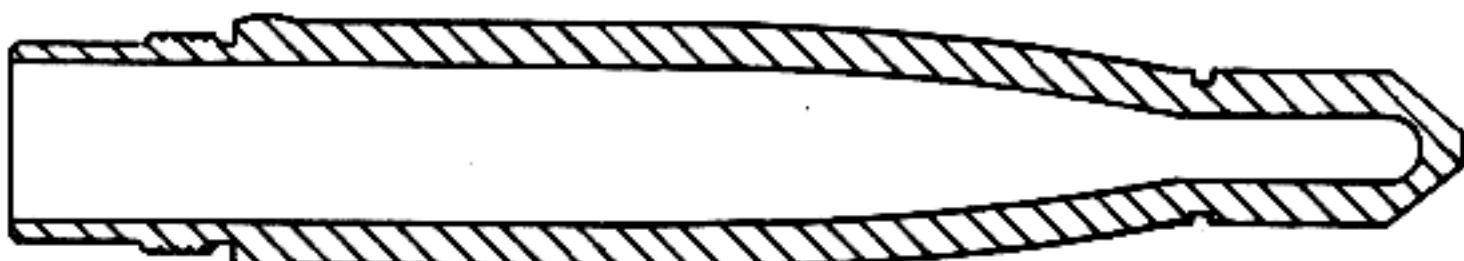
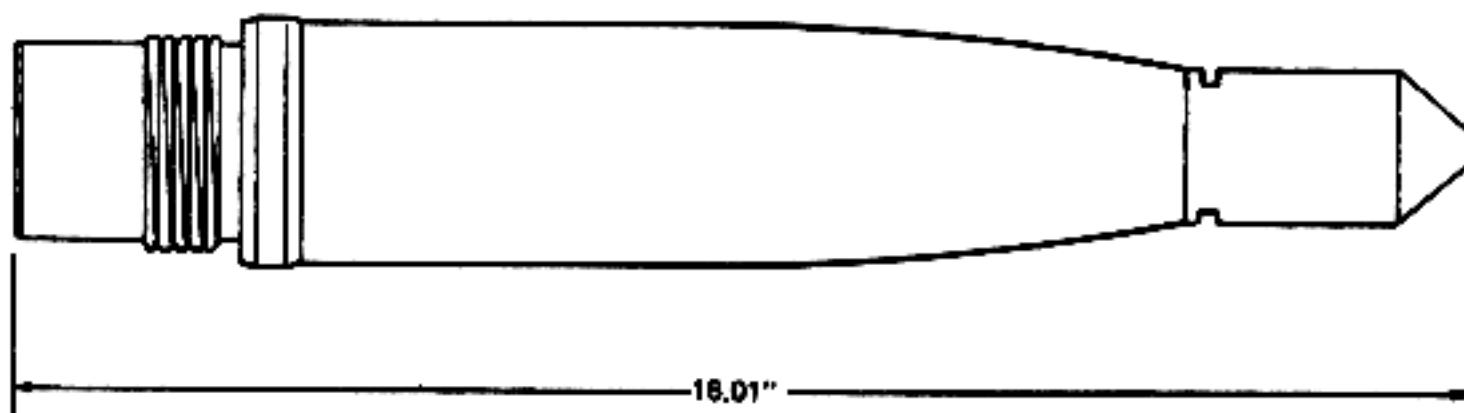
Inner (rocket)
 PA 47 ----- 9235961
 Outer (warhead section w/fuze/motor) ----- 9230114, 9235841

References:

SC 1340/98-IL
 TM 9-1340-222-20
 TM 9-1340-222-34

*See appropriate supply catalog for individual NSN's pertaining to this (these) DODAC(s).

ROCKET, PRACTICE, 2.75-INCH W/INERT WARHEAD WTU-1/B



ARD80-0513

Type Classification:

Std AMCTCM or OTCM 36841 and 9153.

Use:

This warhead is used for training and support testing of other rocket components.

Description:

a. The WTU-1/B warhead is an inert slug warhead having the same shape, weight and center of gravity as the standard M151 warhead. The warhead does not contain a fuze.

b. This warhead simulates flight and trajectory characteristics of the M151 warhead.

Differences between Models: N/A

Functioning:

a. Functioning of the 2.75-in. rocket begins when the firing circuit switch is closed. Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge, which ignites the propelling grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

b. The thrust of the nozzle exhaust blows off the fin retainer and releases the fins. Upon clearing the launcher, the fins are opened by the force of the fin actuating piston pushing on the heels of the fins. The fins are held by the crosshead of the piston at an angle of 45° with the axis of the motor tube.

Tabulated Data:

Warhead model --- WTU-1/B
 Type ----- Practice
 Weight----- 8.7 lb
 Length ----- 16 in.
 Body material --- Gray iron
 Color ----- Blue with white markings
 Packing ----- 1 per fiber container;
 4 containers per wooden box
 Packing box:
 Weight
 w/contents ----- 59 lb (26550 g)
 Dimensions ----- 20-13/16 in. x 8-1/4 in. x 9-3/32 in.
 Cube ----- 0.9 ft³

*DODAC ----- 1340-H663

Drawing number ----- 2618015

Drawings:

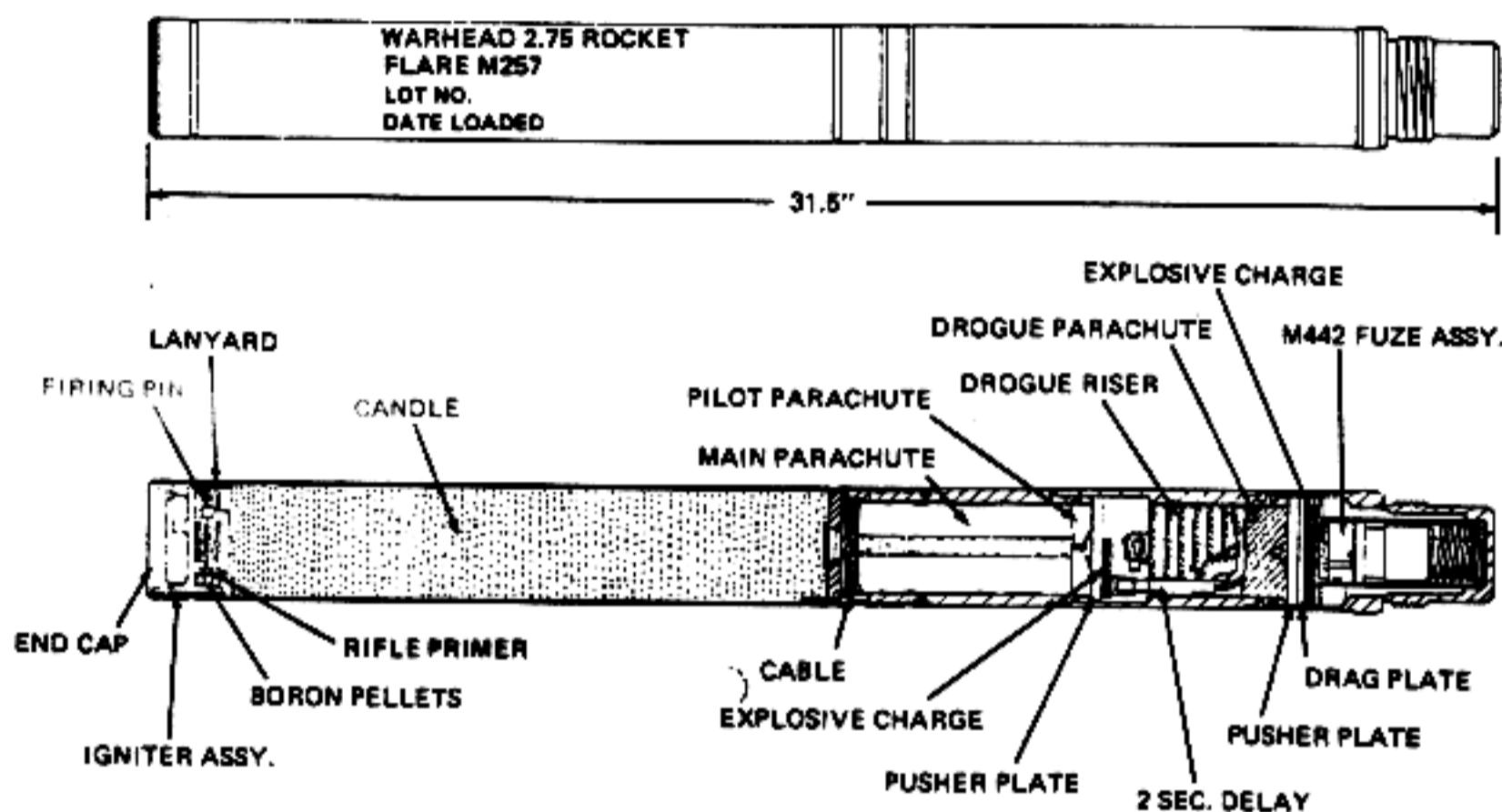
Warhead metal parts assembly --- 656195
 Packing (inner) --- 9231003
 Packing (outer) --- 3888110 & 9230114

References:

TM 9-1340-222-20
 TM 9-1340-222-34
 SC 1340/98-IL

*See appropriate supply catalog for individual NSN's pertaining to this (these) DODAC(s).

ROCKET, FLARE, 2.75-INCH W/M257 ILLUMINATING WARHEAD



ARD80-0524

Type Classification:

STD, LCC-A, TT, HQDA, Jan 76

parachute, drogue parachute assembly, and an integral fuze and delay assembly. The warhead is enclosed in an aluminum case.

Use:

To provide helicopters with target illuminating capability from a safe standoff distance in a hostile environment.

c. The setback-actuated fixed time integral fuze provides a standoff distance of approximately 3,000 meters. The arming fuze and delay assembly is actuated by motor acceleration.

Description:

a. This low-spin folding-fin aircraft rocket (LSFFAR) is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft.

d. The rocket motor is described in Chapter 5.

b. The M257 illuminating warhead consists of an ignition system, flare, main

Differences between Models: N/A

Functioning:

a. The rocket with warhead, flare, M257, is fired from helicopter with

standard 2.75-in. motor Mk 40 to attain elevation between 2000 and 4000 ft at 3000 m downrange. Upon rocket launch, the M442 fuze arms upon acceleration (17 G's approximately required). After 1.5 seconds (at motor burnout) the fuze functions, initiating delay train. After nine seconds, delay ignites first expulsion charge in fuze assembly. Gas pressure forces pusher plate forward, shears pin, separates motor and adapter section from remainder of warhead. Rocket velocity is now 800 fps approximately.

b. The deflector plate, attached by cable to motor adapter, is extended into airstream, deflects path of motor and adapter. Pusher plate, attached to drogue chute, deploys drogue. Rocket warhead velocity then decreases to 200 fps, approximately, during next two seconds.

c. Upon deployment of drogue chute, the gas generator is activated by pull on lanyard attached to drogue. After two seconds, the gas generator functions the second expulsion charge located in retainer block of drogue housing. Gas pressure forces pusher plate forward, shearing pins and separating drogue housing from main chute insert and candle assembly.

d. The pusher plate is attached by a threadline to the pilot chute. The pilot chute is deployed, and, in turn, pulls bag off main chute. The main chute now deploys the steel cable which is attached to the main chute shroud lines on one end, and, in turn, pulls a lanyard attached to candle igniter assembly.

e. The pull on the lanyard rotates a bellcrank, releasing the firing pin. The firing pin fires a rifle primer, which fires boron pellets. The boron pellets ignite a propellant wafer. Propellant ignites the candle. Ignition gases pressurize nose cap, blowing it free.

f. The candle, suspended from the main chute is now burning. During the first 15 seconds, the igniter housing is burned away. The candle descends at 15 fps, burns for 100 seconds with a minimum light output of one million candle power (CP).

Tabulated Data:

Rocket:

Type -----	Mk40, Mod 3
Diameter -----	2.75-in. nominal
Length (max)-----	68.22 in. (w/whd)
Weight -----	21.8 lb (w/whd)

Performance:

Operating temperature limits -----	-25° to +140°F (-31.35° to +59.40°C)
Maximum velocity-----	1600 fps (488 mps)

Warhead:

Model -----	M257
Type -----	Flare
Body -----	Aluminum
Color -----	Olive drab w/white markings
Diameter -----	2.75-in.
Length -----	31.5-in.
Weight -----	10.8 lb

Candle characteristics:

Burn time-----	120 sec nominal
Light output -----	1 mil cp min
Parachute descent rate-----	15 fps approx
Composition -----	Magnesium Sodium Nitrate
Weight -----	5.44 lb (2.47 kg)

Fuze:

Model -----	M442
Type -----	Setback actuated, fixed time
Diameter -----	1.5-in.

Length:

Overall ----- 3.1-in.
 Weight ----- 0.6 lb
 Arming time --- 1.1 sec
 Packing ----- 1 warhead per fiber container, 1 motor per fiber container, unassembled

Box:

Weight w/contents
 (6 fiber containers
 w/3 warheads and
 3 motors,
 unassembled) --- 131 lb (58950 g)
 Dimensions ----- 46-3/16 in. x 11-7/8 in. x 9-9/32 in.

Cubic contents
 (with fiber
 container) ----- 3 ft³

Shipping and storage data:

Storage class/
 SCG ----- 1.2G (08)
 DOT shipping
 class ----- A
 DOT
 designation ----- ROCKET AMMUNITION WITH ILLUMINATING PROJECTILE

Field storage---- Group D
 DODAC ----- 1340-H180

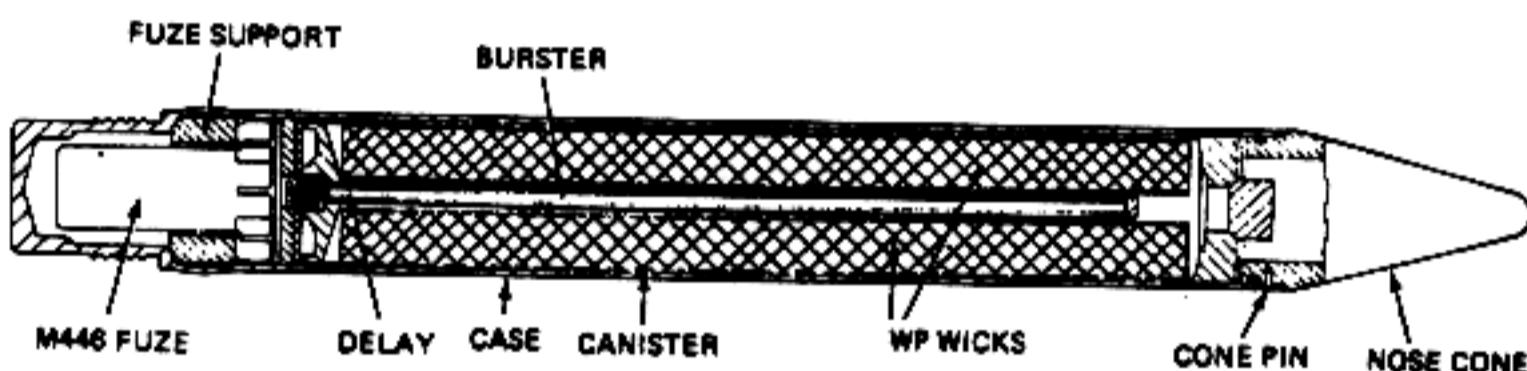
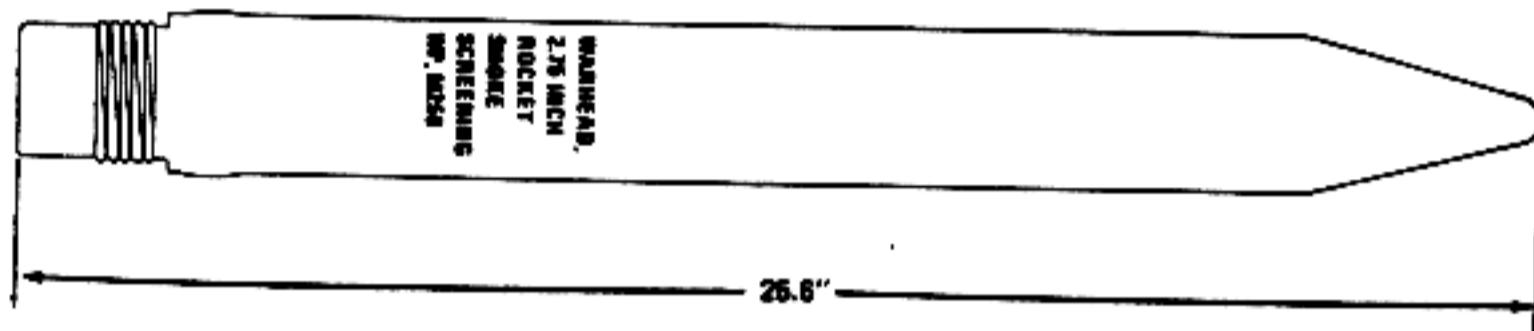
Drawings:

Warhead loading
 assembly ----- 7 U 48300
 Packing (inner)--- 7 U 100281
 Packing (outer) -- 8883479

References:

TM 9-1340-222-20
 TM 9-1340-222-34

ROCKET, 2.75-INCH, SMOKE SCREENING WP, M259



ARD80-0525

Type Classification:

STD AMCTCM or OTCM 08786008

Use:

This rocket is used to provide a protective smoke screen. A group of rockets will provide a smoke screen for approximately five minutes. It is usually deployed from low speed rotary-wing aircraft.

Description:

The rocket warhead M259 consists of an aluminum casing, an internal canister assembly and a mechanical fuze with delay charge. The canister assembly consists of

ten white phosphorous (WP) filled submunitions, a central burster, and a pyrotechnic delay detonator system. The canister is 2-1/2-in. in diameter and 16-in. long with a rear end plate containing a central burster tube and a forward end plate containing a WP filling port and a closure plug. The submunitions are perforated steel sheet formed into two sets of five pie shaped containers packed with fiberglass. The fiberglass serves as a matrix for physically holding the WP and it restricts the flow of WP during functioning to produce a greater than five min smoke source. The central burster is primacord. The pyrotechnic delay detonator system initiates the burster. The M446 fuze is a mechanical escapement

type with a 4-1/2 second pyrotechnic delay, arming on acceleration and functioning at deceleration. The warhead base is externally threaded for attachment to a standard Mk 40 Mod 3 motor.

Functioning:

When the rocket motor is actuated the fuze is armed. Six seconds after launch the fuze actuates the expulsion charge to eject the canister assembly out the nose of the warhead, approximately 2500 m down range. This charge also ignites the central burster in the canister assembly, which after a 0.25 second delay, initiates the burster charge. When the burster charge functions, it ruptures the canister and disperses the submunitions.

Tabulated Data:

Rocket:

Model -----	M259
Type -----	White phosphorous
Weight -----	19.6 lb (motor + whd)
Length -----	62.9 in. (motor + whd)
Diameter -----	2.75 in.

Components:

Fuze -----	M446
Weight -----	0.6 lb (272 g)
Type -----	Mechanical-setback actuated fixed time

Warhead:

Weight -----	8.75 lb
Diameter -----	2.75 in.
Length -----	25.6 in.

Filler:

Type -----	White phosphorous
Weight -----	3.5 lb (1.59 kg)

Temperature limits:

Firing -----	-40° to +150°F (-39.6° to +64.9°C)
--------------	---------------------------------------

Packing -----	4 rockets consisting of Warhead, Smoke, WP, M259 with rocket motor per fiber container; 4 containers per wooden box
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Packing box:

Weight -----	135.0 lb
Dimensions -----	72-4/5 in. x 8-3/4 in. x 9-1/2 in.

Cube -----	3.5 ft ³
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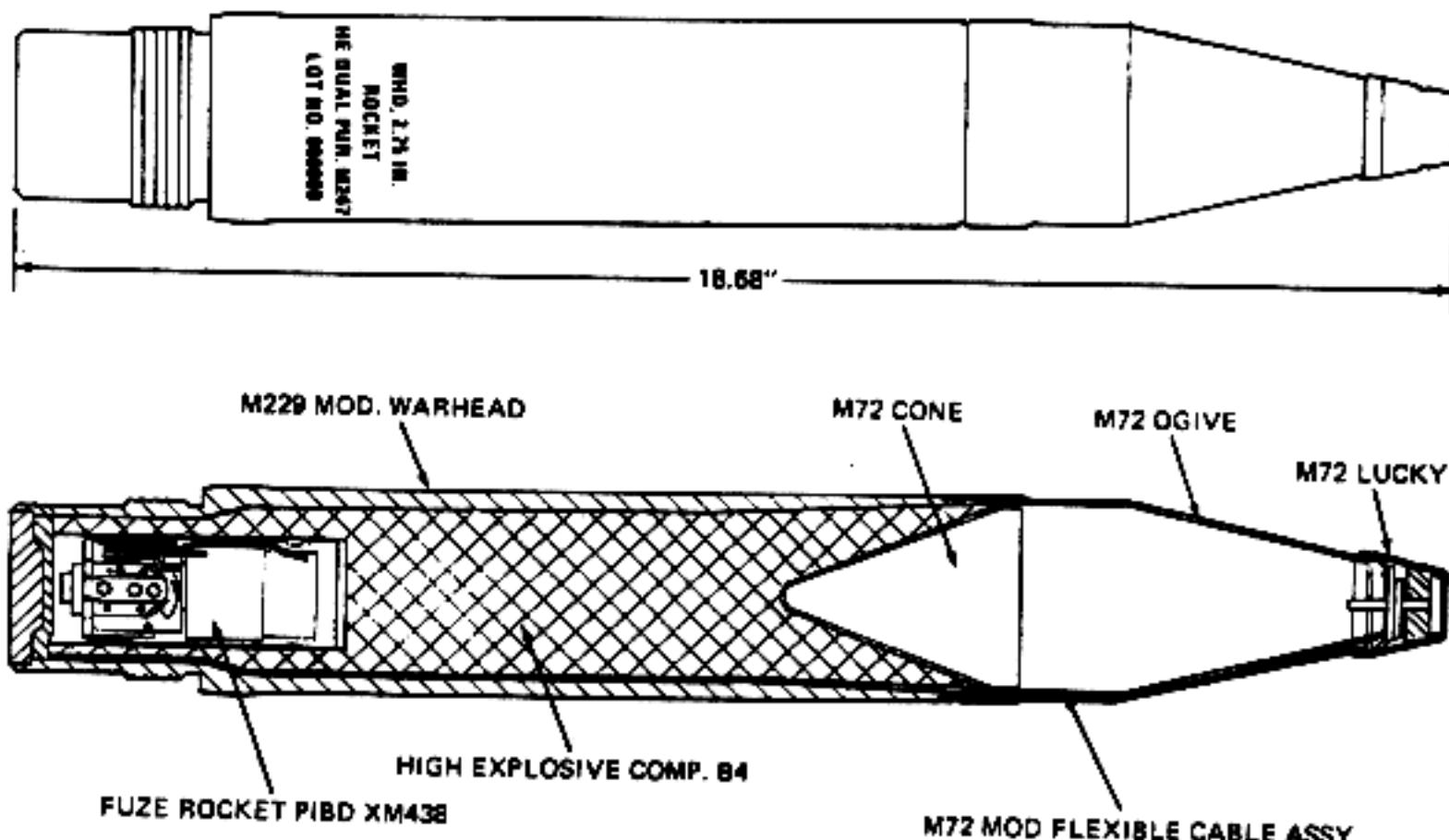
Shipping and Storage Data:

Storage class/	
SCG -----	1.2H (12)
DOT shipping	
class -----	A
DOT designation--	ROCKET AMMUNITION W/SMOKE PROJECTILES EXPLOSIVE A AND FLAMMABLE LABELS REQUIRED
Field storage ---	Group C
DODAC -----	1340-H116
Drawing number ---	D90-1-332

References:

- TM 9-1055-460-14
- TM 9-1090-202-12
- TM 9-1090-203-12
- TM 9-1300-206
- TM 9-1340-222-20
- TM 9-1340-222-34
- TM 750-244-5-1

ROCKET, DUAL PURPOSE, 2.75-INCH HE W/WARHEAD, M247



ARD80-0526

Type Classification:

LP 9354, LP-U 04736108

Use:

To meet the needs of simultaneously defeating enemy armor and personnel.

Description:

A low-spin folding-fin aircraft rocket (LSFFAR), air-to-ground primarily deployed from rotary-wing and other low-speed aircraft.

The warhead section configuration matches the weight and flight characteristics of the M151 HE warhead. The fragmentating body is a take-off from the M229 HE warhead. The shaped charge section is the copper liner core which was developed for a light antitank weapon (LAW).

The warhead employs the M438 fuze. The armor penetration of this warhead is approximately the same as the M72 LAW with antipersonnel performance approximately 70 percent of that of the M151 HE warhead.

Functioning:

a. Fuze Functioning. The M438 is an integral point initiating, base detonating fuze for the M247 dual purpose warhead. The quick-response nature of the M247 warhead program dictated that standard, proven components be used for the design of its fuze. Therefore, the M438 fuze system consists of the initiating crystal from the M72 LAW, and the safety and arming device, thermal battery, and impact switch from the M429 proximity fuze. A component board assembly (CBA) is incorporated to provide fuze intelligence and safety.

Ideally, the fuze is initiated by the crystal upon impact. This provides maximum performance of the warhead. A "spiked" target impact or a graze impact will function the fuze through the backup impact switch. However, the shaped charge effect may be reduced. The CBA, which interprets the impact signal, also provides an impact sensitivity feature which allows some vegetation penetration prior to functioning.

Since the M429 S&A has a rearward firing detonator arrangement, the booster is located at the aft end of the fuze. This arrangement, unique in contemporary ordnance practice, is performing successfully and reliably.

Safety features include:

(1) A pre-armed fuze capable of being fired only for the duration of the life of the battery (30 seconds). After this time has elapsed, the fuze cannot be functioned by any mode.

(2) The fuze, upon arming, will sense a shorted impact switch and will fail safe to preclude functioning at arming.

(3) An impact switch which precludes battlefield contamination with live duds.

d. Rocket Functioning. When the rocket is launched the fuze becomes armed from inertial forces resulting from sustained acceleration. This frees the unbalanced rotor to turn and lock the explosive train in the armed position. Upon impact with a target, the piezo electric crystal is crushed and initiates the explosive train. Upon detonation, the warhead body shatters into small high-velocity fragments. The copper cone is collapsed by the detonation forming a stream of high-velocity particles which penetrate armor.

Tabulated Data:

Warhead model -----	M247
Type -----	HE dual purpose
Weight (fuzed) -----	8.8 lb
Length -----	18.68 in.
Filler:	
Type -----	Comp B4
Weight -----	2.0 lb (0.91 kg)
Color-----	Black w/yellow markings
Temperature limits:	
Firing -----	-65° to +150°F (-53.35° to +64.9°C)
Storage -----	-65° to +150°F (-53.35° to +64.9°C)
Drawing number ---	9230114, 9235841
Packing for complete round-----	1 rocket consisting of warhead HE, dual purpose with fuze M438 and motor Mk 40, and Mods, 1 per inner pack, 4 per box

Packing box:

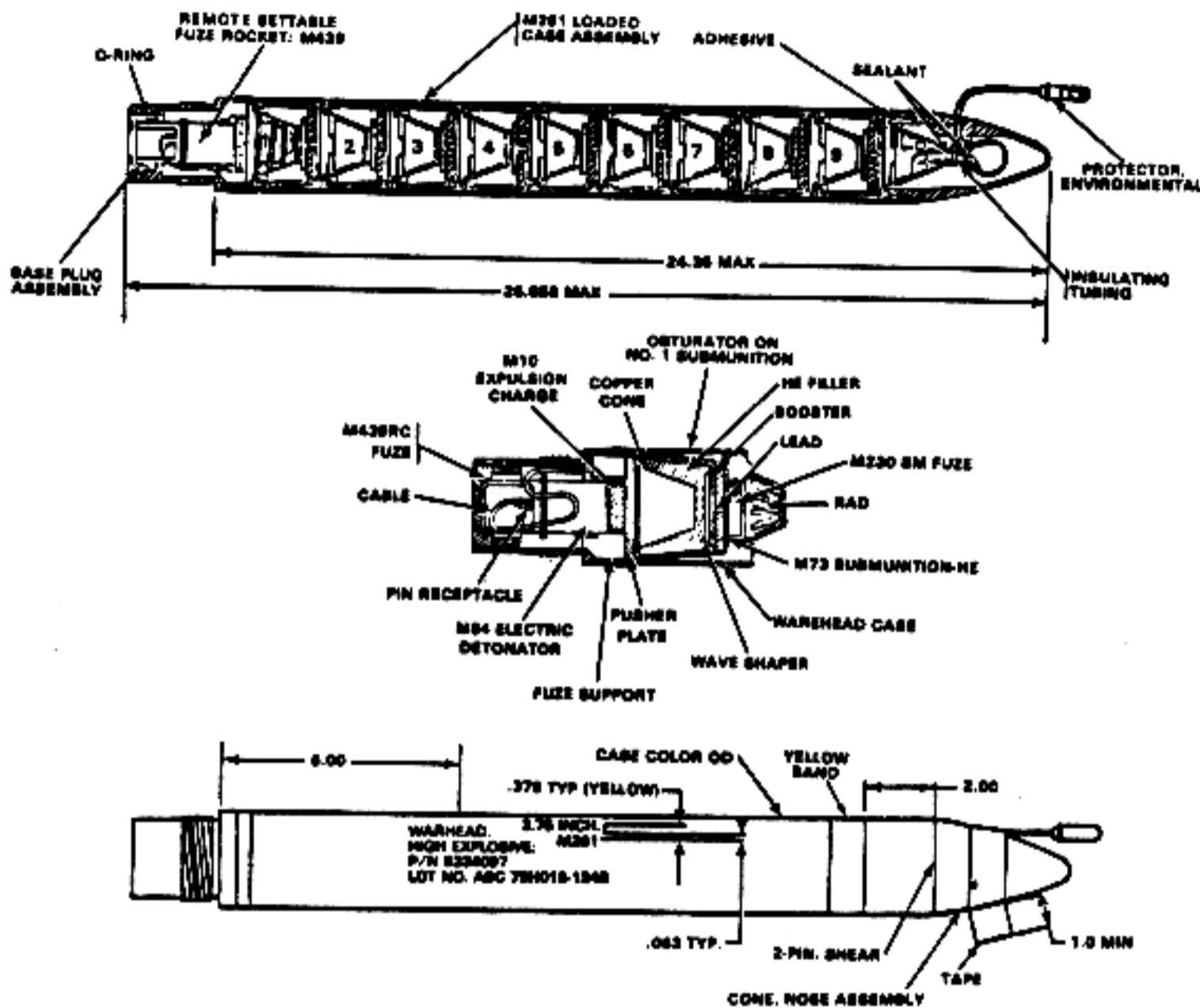
Weight w/contents -----	162 lb
Dimensions-----	62-13/16 in. x 8-11/16 in. x 9-1/2 in.

Cube ----- 3.5 ft³

Shipping and storage data:

Storage class/ SCG -----	1.1E
DOT shipping class -----	A
DOT designation--	ROCKET AMMUNI- TION W/EXPLOSIVE PROJECTILES
Field storage ---	Group F
DODAC -----	1340-H826
Drawing number ---	9258191
References:	
TM 9-1340-222-20	SC 1340/98-IL
TM 9-1340-222-34	

**ROCKET, HIGH - EXPLOSIVE, 2.75 INCH, MULTIPURPOSE
SUBMUNITION (MPSM) W/M261 WARHEAD**



AR102012B

Type Classification:

STD (LCC-A).

Use:

The warhead contains 9 each multipurpose submunitions for use against personnel, materiel, and light armor.

Description:

The complete round consists of a warhead with an integral fuze and a rocket motor.

The warhead consists of: (1) a nose cone assembly, (2) a warhead case, (3) an integral fuze, (4) 9 submunitions, and (5) an expulsion charge assembly. The nose cone assembly, a plastic cone bonded to a metal cup-shaped base, is attached to the body by shear pins. The body is a hollow cylinder loaded with 9 full caliber multipurpose submunitions (MPSM). Each submunition has a Ram Air Decelerator (RAD), folded, which nests into the shaped charge cone of the submunition ahead; the 9th (forward) submunition nests into the forward cup which makes up the base of the nose cone. A metal pusher plate is located just aft of the submunition cargo stack and is forward of

the expulsion charge assembly. The threaded end of the body is machined internally to accommodate a base detonating, remote settable, variable range fuze.

The primary warhead fuze, M439 RC, is a resistance-capacitance electronic variable time delay fuze. The time delay is remotely set for the desired functioning distance(time) by charging the circuit from the fire control center. The fuze begins timing at the first motion of the rocket and will function at the prescribed time if the Safety and Arming device (S&A) is armed. The S&A is a mechanical acceleration integrator with an unbalanced rotor holding the M84 electric detonator and a runaway escapement. An acceleration greater than 27G is necessary to arm the fuze. The M439 RC fuze is a base mounted, forward firing fuze. The fuze connector cable extends from the fuze, through the warhead (in a lengthwise channel), and exits the ogive for connection to the launcher by an umbilical cable.

The HE, MPSM M73 consists of a steel body with a fragmenting wall filled with Composition B explosive incorporating a shaped charge liner, LX14 booster, explosive lead charge, M230 omnidirectional fuze with M55 detonator, wave shaper, and fabric drag device (RAD). The fragmenting body produces 10 grain fragments with a maximum velocity of approximately 5,000 fps.

The spin stabilized wraparound fin rocket is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It can also be used on Air force and Navy jet aircraft, as well as in the Mobile Ground Launcher System.

Functioning:

The rocket motor functions when current passes through the launcher firing contact to the igniter in the rocket motor. The current generates the heat necessary to detonate the igniter charge which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

Upon receipt of the fire signal from the pilot,

the remote fuze setter processes the proper time constant (delay) to the M439 RC electronic time fuze immediately prior to firing the rocket. The intervalometer delivers a 160 millisecond pulse interval. The pulse is divided into a 45 millisecond fuze charging pulse, followed by a 45 millisecond rocket firing pulse. The remaining 70 milliseconds are used as dwell interval to maintain spacing between pairs of rockets fired.

After the rocket is fired and experiences sustained acceleration, the setback weight of the S&A device within the fuze moves rearward sufficiently to allow the roller attached to the unbalanced rotor to move out of the groove provided by the setback weight. Once the roller is free, the unbalanced rotor rotates in response to the acceleration forces. The rotation of the rotor is delayed by a runaway escapement which provides an arming delay (a function of the acceleration) until the rocket is a safe distance from the aircraft. When the setback weight experiences the necessary magnitude of acceleration, the rotor will lock into place with the M84 detonator lined up with the propellant charge and the fuze is armed. The detonator is now connected to the firing circuit, the connection between the electronic module and the umbilical cable is broken, and electronic timing is started.

From 1.2 to 25 or more seconds after firing, depending upon the range setting, the detonator is initiated electrically and ignites the expelling charge. Gases from the expelling charge force the pusher plate and cargo stack forward, shearing the nose cone (ogive) retaining pins and ejecting the submunitions into the airstream. The actual ejection range is some distance from the target as determined by the fire control computer along with the aircraft QE based on aircraft elevation, ground speed, and range to target.

The M73 MPSM operation is as follows: Upon release of the submunitions into the airstream, the RAD high drag device inflates by Ram air forced through holes in air scoops. The arming stem in the M230 fuze breaks the safety shear wire and retracts, freeing the slider which is then moved across the runaway escapement delay to bring the detonator into line with the firing pin. The fuze is now fully armed.

If the submunition should be subjected to an impact force applied in any direction, the sensing mass will move and release the locking ball holding the firing pin. The firing pin drives forward and initiates the detonator. The shaped charge liner penetrates armor or other material in line with its axis and the submunition body shatters into small, high velocity fragments to defeat soft targets.

Tabulated Data:

Warhead:

Type -----	2.75-in.
	Rocket, HE,
	Multipurpose
	Submunition
	(MPSM)

Weight (fuzed) -----	13.6 lb
Length (overall) -----	26.86 in. (max)

Body material -----	Extruded
	aluminum

Fuze (integral):

Type (electronic) -	M439 RC
Length -----	2.77 in.
Diameter -----	1.48 in. (max)
Delay element -----	Electronic
Delay time -----	Variable
Detonator -----	M84 electrical
Setback to arm ---	27 g
Arming distance ---	96-126 m

Expulsion charge: -----	M10(80%), black
	powder(20%)

Propellant weight -----	5.5 g
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Filler (payload):

Type -----	M73 HE Multi-
	purpose Sub-
	munition (MPSM)

Quantity -----	9 ea
----------------	------

Weight:

Each -----	1.2 lb
Total -----	10.8 lb

HE Charge (Comp B):

Net HE:

Quantity:	
Each -----	0.2 lb
Total -----	1.8 lb

Booster LX14:

Each -----	0.031 lb
Total -----	0.279 lb

Detonator M55:

Charge -----	Lead azide -
	NOL#130 55 mg

Lead, PBX-N5 -----	120 mg
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Color -----	Olive drab with
	yellow markings and a
	yellow band

Temperature Limits:

Firing -----	-50° to +150°F
Storage -----	-50° to +160°F

Packaging for complete	round -----
------------------------	-------------

1 rocket consists	of warhead M261
	and rocket motor
	MK66 Mod 1 per
	fiber container;
	4 containers per
	wooden box

Packing box, wooden:

Weight with contents	(4 warheads in con-
	tainers):

With inert	motors -----
	138 lb

With MK66	motors -----
	162 lb

Weight unloaded -----	32 lb
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Dimensions -----	72-13/16 x 8-11/16
	x 9-1/2 in.

Cube -----	3.5 cu ft
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Shipping and Storage Data: (Warhead w/o motor)

Quantity-distance

class -----	1.1
-------------	-----

Storage compatibility

group -----	D
-------------	---

DOT shipping class -----	A
--------------------------	---

DOT designation -----	EXPLOSIVE PRO-
	JECTILES -
	DANGEROUS

Field storage -----	Group F
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Shipping and Storage Data: (Complete Round)

Quantity-distance

class -----	1.1
-------------	-----

Storage compatibility

group -----	E
-------------	---

DOT shipping class -----	A
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DOT label -----	Explosive A
DOT designation -----	ROCKET AMMUNITION
	W/EXPLOSIVE PRO-
	JECTILES

Field storage -----	Group F
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DODAC for complete	round -----
	1340-H464

References:

TM 9-1300-200, Chapter 5

TM 9-1300-206

TM 9-1055-460-14

TM 9-1340-201

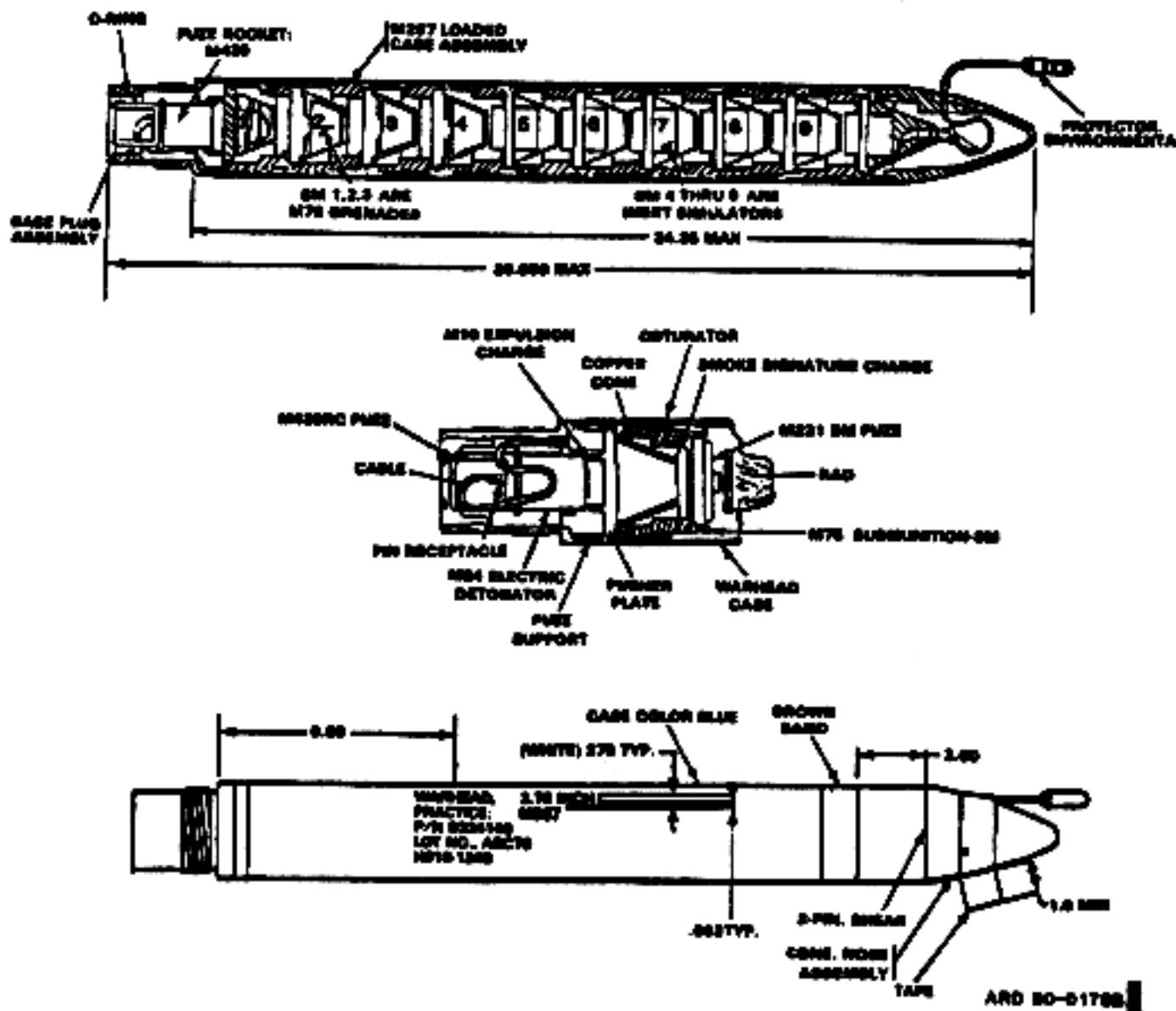
TM 9-1340-222-20

TM 9-1340-222-34
SB 742-1340-92-010
SB 742-1340-94-301
MIL-STD-1168A (28 Feb 75)

Drawings:

9334097, Warhead, 2.75-Inch High Explosive:
M261
9334122, M261, Loaded Case Assembly
9334143, Grenade, General Purpose High
Explosive M73
233AS400, (Navy), MK66, Mod 1 Motor,
Loaded Assembly

ROCKET, 2.75 INCH, PRACTICE W/M267 WARHEAD



Type Classification:

STD (LCC-A).

Use:

The warhead contains 3 each smoke signature multipurpose submunitions and 6 simulators for use in training and for practice firing.

Description:

The complete round consists of a warhead with an integral fuze and a rocket motor.

The warhead consists of: (1) a nose cone assembly, (2) a warhead case, (3) an integral fuze, (4) 9 submunitions, and (5) an expulsion charge assembly. The nose cone assembly, a plastic cone bonded to a metal cup-shaped base, is attached to the body by shear pins. The body is a hollow cylinder loaded with 3 full caliber practice submunitions and 6 simulators. Each submunition has a Ram Air Decelerator (RAD), folded which nests into the shaped charge cone of the submunition ahead; the 9th forward simulator assembles into the base of the nose cone. A metal pusher plate is located just aft of the submunition cargo stack and is forward of the expulsion charge assembly. The threaded end of the body is machined internally to accommodate

a base-detonating, remote settable, variable range fuze.

The primary warhead fuze, M439 RC, is a resistance-capacitance electronic variable time delay fuze. The time delay is remotely set for the desired functioning distance (time) by charging the circuit from the fire control center. The fuze begins timing at the first motion of the rocket and will function at the prescribed time if the Safety and Arming Device (S&A) is armed. The S&A is a mechanical acceleration integrator with an unbalanced rotor holding the M84 electric detonator and a runaway escapement. An acceleration greater than 27G is necessary to arm the fuze. The M439 RC fuze is a base mounted, forward firing fuze. The fuze connector cable extends from the fuze, through the warhead (in a lengthwise channel), and exits the ogive for connection to the launcher by an umbilical cable.

The M75 SM consists of a steel body with a smoke signature flash charge and the identical outside configuration as the M73 HE grenade. It has the same weight and center of gravity as the loaded HE grenade. The M231 omni-directional fuze is used in this practice grenade.

The spin stabilized wrap around fin aircraft rocket is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It can also be used on Air Force and Navy jet aircraft, as well as in the Mobile Ground Launcher System.

Functioning:

The rocket motor functions when current passes through the launcher firing contact to the igniter in the rocket motor. The current generates the heat necessary to detonate the igniter charge which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

Upon receipt of the fire signal from the pilot, the remote fuze setter processes the proper time constant (delay) to the M439 RC electronic

time fuze immediately prior to firing the rocket. The intervalometer delivers a 160 millisecond pulse interval. The pulse is divided into a 45 millisecond fuze charging pulse, followed by a 45 millisecond rocket firing pulse. The remaining 70 milliseconds are used as a dwell interval to maintain spacing between pairs of rockets fired.

After the rocket is fired and experiences sustained acceleration, the setback weight of the S&A device within the fuze moves rearward sufficiently to allow the roller attached to the unbalanced rotor to move out of the groove provided by the setback weight. Once the roller is free, the unbalanced rotor rotates in response to the acceleration forces. The rotation of the rotor is delayed by a runaway escapement which provides an arming delay (a function of the acceleration) until the rocket is a safe distance from the aircraft. When the setback weight experiences the necessary magnitude of acceleration, the rotor will lock into place with the M84 detonator lined up with the propellant charge and the fuze is armed. The detonator is now connected to the firing circuit, the connection between the electronic module and the umbilical cable is broken, and electronic timing is started.

From 1.2 to 25 or more seconds after firing, depending upon the range setting, the detonator is initiated electrically and ignites the expelling charge. Gases from the expelling charge force the pusher plate and cargo stack forward, shearing the nose cone (ogive) retaining pins and ejecting the submunitions into the airstream. The actual ejection range is some distance from the target as determined by the fire control computer along with the aircraft QE based on aircraft elevation, ground speed, and range to target.

The M75 SM, operation is as follows: Upon release of the submunitions into the airstream, the RAD high drag device inflates by Ram air forced through holes in air scoops. The arming stem in the M231 fuze breaks the safety shear wire and retracts, freeing the slider which is then moved across the runaway escapement delay to bring the detonator into line with the firing pin. The fuze is now fully armed. If the submunition should be subjected to an impact force applied in any direction, the sensing mass will

move and release the locking ball holding the firing pin. The firing pin drives forward and initiates the detonator. The detonator ignites the smoke pyrotechnic charge, resulting in a brilliant flash and a puff of white smoke.

Tabulated Data:

Warhead:

Type -----	2.75-in. Rocket, Practice, M267
Weight (fuzed) -----	13.6 lb
Length (overall) -----	26.86 in. (max)
Body material -----	Extruded aluminum (one piece)

Fuze (Integral):

Type (electronic) ----	M439 RC
Length -----	2.77 in.
Diameter -----	1.48 in. (max)
Delay element -----	Electronic
Delay time -----	Variable
Detonator -----	M84 electrical
Setback to arm -----	27 g
Arming distance ---	96-126 m

Expulsion Charge: -----	M10 (80%), black powder (20%)
Propellant weight -----	5.5 g

Filler (Payload):

Type -----	M75 SM
Quantity -----	3 ea M75 & 6 ea inert simulators

Weight:

Each -----	1.2 lb
Total -----	10.8 lb

Smoke Charge:

Aluminum powder	67%
Potassium Perchlorate	33%

Net

Quantity:	
Each -----	0.04 lb (17 g)
Total -----	0.12 lb (51 g)

Detonator M55:

Charge -----	Lead azide-NOL #130 55 mg
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Color-----	Blue with white markings and brown band
Temperature Limits:	

Firing -----	-50° to + 150°F
Storage -----	-50° to + 160°F

Packaging for complete round -----	1 rocket consists of warhead M267 & rocket motor MK66 Mod 1 per fiber container; 4 containers per wooden box
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Packing box, wooden:

Weight with contents (4 warheads in containers):	
With inert motors -	138 lb
With MK66 motors	162 lb
Weight unloaded -----	32 lb
Dimensions -----	72-13/16 x 8-11/16 x 9-1/2 in.
Cube -----	3.5 cu ft

Shipping and Storage Data (Warhead Only):

Quantity-distance class -----	1.3
Storage compatibility group	G
DOT shipping class -----	C
DOT designation -----	SPECIAL SMOKE SIGNAL - HANDLE CAREFULLY - KEEP FIRE AWAY

DOT label -----	Explosive C
Field storage -----	Group F
DODAC for complete round	1340-H463

Shipping and Storage Data (Complete Round):

Quantity-distance class -----	1.3
Storage compatibility group	G
DOT shipping class -----	A
DOT designation -----	ROCKET AMMUNITION WITH SMOKE SIGNAL PROJECTILE

References:

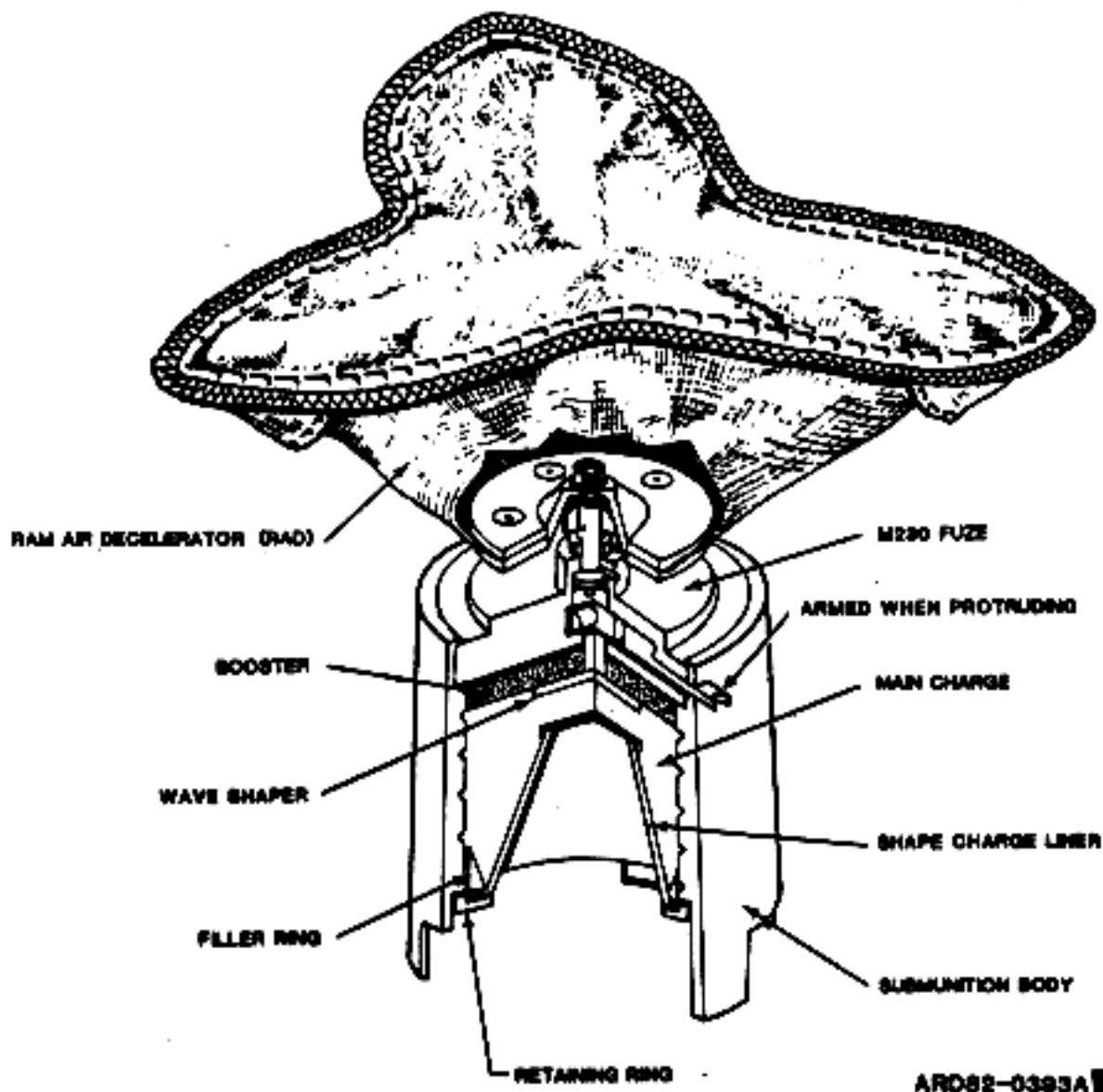
TM9-1300-200, Chapter 5
TM 9-1300-206
TM 9-1055-460-14
TM 9-1340-201
TM 9-1340-222-20
TM 9-1340-222-34
SB 742-1340-92-010
SB 742-1340-94-301
MIL-STD-1168A (28 Feb 75)

Drawings:

9334148, Warhead, 2.75-Inch, Practice M267
9334123, M267, Loaded Case assembly
9334151, Grenade, General Purpose, Practice,
M75
233AS400, (Navy), MK66 Mod 1 M Motor,
Loaded Assembly

GRENADE, GENERAL PURPOSE, HE: M73
MULTIPURPOSE SUBMUNITION (MPSM), HIGH EXPLOSIVE

M73 SUBMUNITION (ARMED)



Type Classification:

STD (LCC-A).

Use:

The M261 warhead contains 9 each MPSM's M73 for use against personnel, materiel, and light armor.

Description:

The submunition grenade consists of a full caliber, cylindrical tapered steel casing, prescored internally for controlled fragmentation, a Ram Air Decelerator (RAD) device for orientation and stabilization, a truncated shaped charge liner,

wave shaper and the M230 omni-directional fuze with explosive train. The kill mechanism is a truncated subcaliber, 44° included angle, shaped charge copper liner 33.02mm (1.3 in.) high. The submunition detonation is initiated by the M230 fuze which is armed by the action of the Ram Air Decelerator on ejection from the warhead.

Functioning:

When the warhead fuze functions, the expulsion charge is initiated and, by means of a pusher plate, presses the submunitions forward until the nose cone retaining pins are sheared and the submunitions are expelled into the airstream. The RAD high drag device inflates and turns the submunition forward and toward the ground.

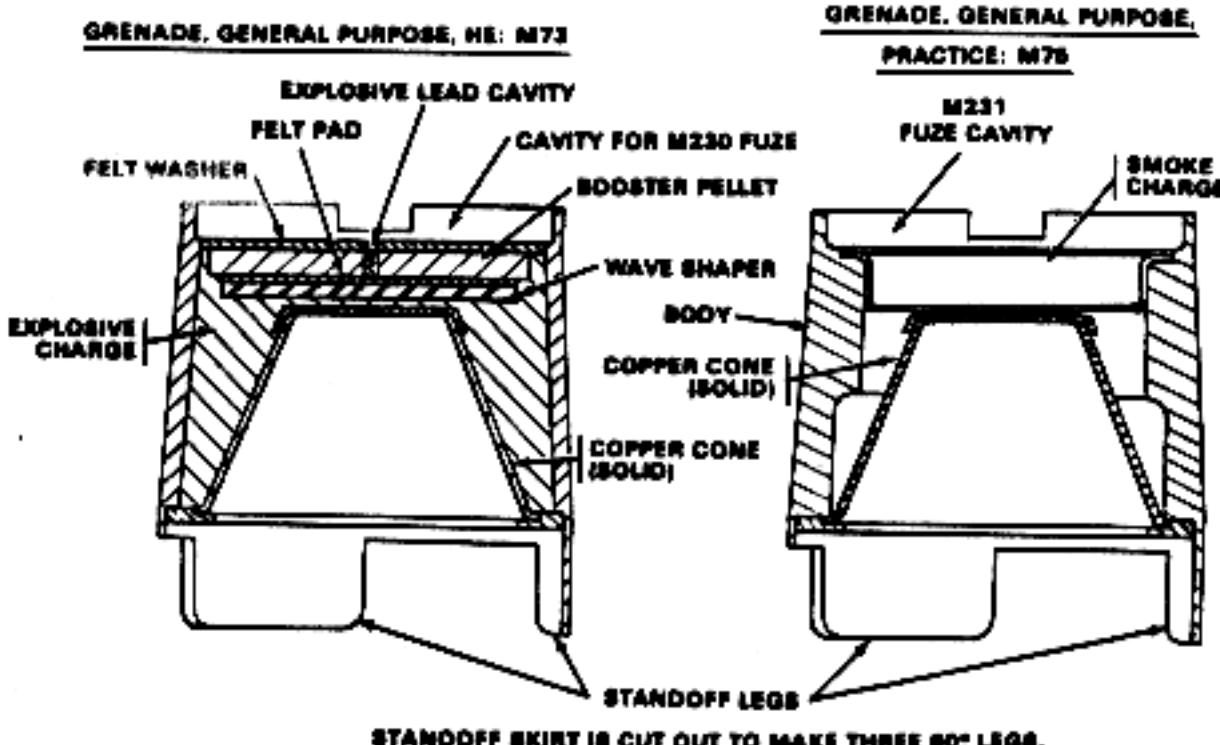
The shock of inflation by Ram air forced through holes in the air-scoops in the RAD exerts a strong drag on the arming stem in the M230 fuze, in excess of 20 pounds, which breaks the safety shear wire. The fuze arming stem retracts approximately 0.110 inch and the arming pin at the base of the stem is withdrawn from the slider. The slider is then driven across the runaway escapement delay mechanism by its spring to bring the detonator into line with the firing pin. The fuze is now fully armed. If the submunition should be subjected to an impact force applied in any direction (as striking the ground or a vehicle), the sensing mass will move and release the locking ball holding back the spring loaded firing pin. The firing pin is driven forward and initiates the M55 stub detonator. The detonator sets off, in sequence, the explosive lead, the booster charge, and the high explosive main charge. The shaped charge lines penetrates light armor or other material in line with its axis and the submunition body shatters into small, high velocity fragments to defeat soft targets.

Tabulated Data:

Nomenclature: Grenade, General Purpose: M73

Length, fuzed with folded RAD (approx) -----	4 in.
Diameter (max) -----	2.55 in.
Material, steel, thickness -----	0.125 in.
Weight, loaded -----	1.2 lb
Explosive charge, Comp B, net -----	0.2 lb (90 g)
Detonator, M55, and PBX- N5 lead, charge -----	175 mg
Booster LX14 -----	0.031 lb (14 g)
Cone, material -----	Copper
Diameter -----	50.8mm (2 in.)
Height (truncated) -----	33.02mm (1.3 in.)
Angle, included -----	44°
Standoff -----	19.3mm (.76 in.)
Wave shaper material -----	Lead
Fragments:	
Weight -----	10 gr
Shape: platelet -----	2.54 x 6.15 x 6.15mm
Total number (approx) --	195
Fuze: -----	M230
Weight (approx) -----	0.25 lb
Drawing No. -----	9333825
Grenade Drawing No. -----	9334143

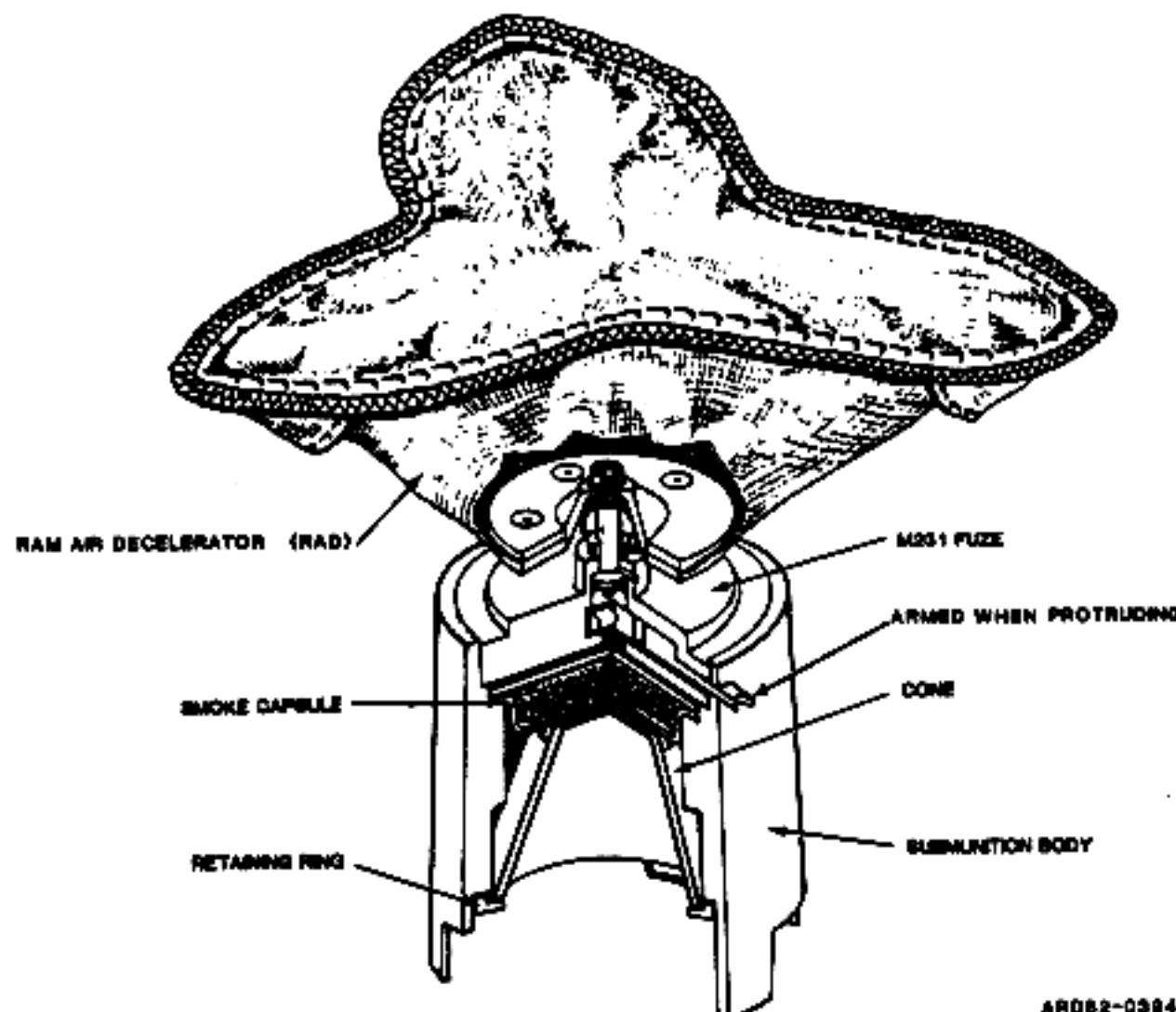
Comparison of HE and Practice Grenades



NOTE: EACH CORNER OF THE TRI-CORNER RAD IS ORIENTED OVER A LEG CENTERLINE FOR FLIGHT STABILITY.

GRENADE, GENERAL PURPOSE, PRACTICE: M75

M75 SUBMUNITION (ARMED)

Type Classification:

STD (LCC-A).

Use:

The M267 warhead contains 3 each M75 practice submunitions and 6 inert simulators for use in training..

Description:

The M75 submunition consists of a steel body with a smoke signature flash charge. The body has the identical outside configuration as

the M73 HE grenade. However, the wall is thicker and is machined out so that the finished grenade with the smoke capsule has the same weight and center of gravity as the loaded HE grenade. The smoke/flash charge consists of 17 grams of a mixture of potassium perchlorate (33%) and aluminum powder (67%). The charge is ignited by the M55 detonator in the M231 omni-directional fuze. The M231 fuze is identical to the M230 fuze (used with the HE grenade) except that there is no explosive lead and no booster pellet. There is no wave shaper; the smoke capsule is directly below the fire hole of the fuze.

Functioning:

The functioning of the M75 grenade is similar to that of the M73 HE grenade and the submunition fuze M231 functions the same as the M230 fuze. When the grenade is armed (the slider now projects approximately 0.25 inch out of the grenade body), and if it is subjected to an impact force applied in any direction (by striking the ground or a hard object), the sensing mass moves on its pivot and releases the locking ball holding back the firing pin. The firing pin, driven by its spring, strikes the M55 stab detonator which, in turn, ignites the smoke pyrotechnic charge, resulting in a brilliant flash and a puff of white smoke.

Tabulated Data:

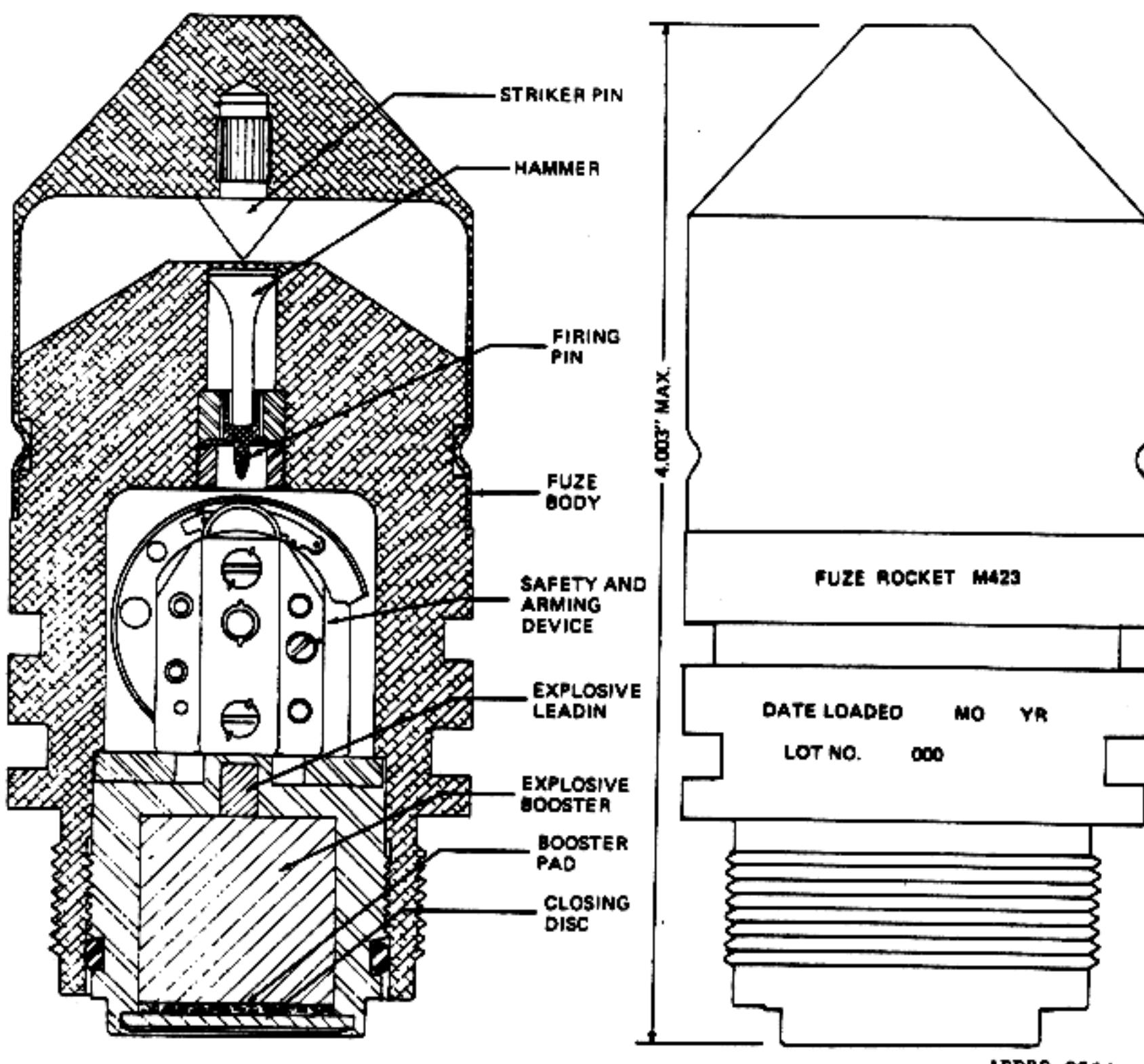
Nomenclature: Grenade, General Purpose, Practice: M75

Tabulated Data: (continued)

Length, fuzed with folded RAD (approx) -----	4 in.
Diameter (max) -----	2.55 in.
Material -----	Steel (low carbon)
Weight, loaded -----	1.2 lb
Smoke charge (33% potassium chlorate/67% aluminum powder) -----	17 g (0.04 lb)
Cone material -----	Copper
Diameter -----	50.8mm (2 in.)
Height (truncated) -----	33.02mm(1.31 in.)
Angle (included) -----	44°
Fuze: -----	M231
Drawing No. -----	9345168
Grenade Drawing No. -----	9334151

CHAPTER 4
FUZES W/2. 75-INCH ROCKETS

FUZE, POINT DETONATING, M423 (M427)

Type Classification:

STD AMCTCM 3233

Use:

These fuzes are oblique impact sensitive, point detonating, super-quick types. Refer to paragraph 3-1, Table 3-1 for the authorized warheads which use this fuze.

Description:

These fuzes consist of the following major assemblies:

- (1) The striker-pin body assembly consists of an aluminum body with a press-fitted steel striker pin. The lower portion of the body is secured to the firing pin body by a circumferential crimp. Upon impact,

crush-up initiates the primer and subsequent explosive train.

(2) The firing pin body assembly consists of a firing pin body, plastic hammer, firing pin sleeve, anti-setback washer, firing pin nut, and firing pin. The threads on the lower portion of the body assembly are used for assembling the fuze to the warhead.

(3) The safety-and-arming device consists of a rotor-housing assembly and unbalanced rotor assembly, an escapement assembly and setback weight. The unbalanced rotor assembly houses the primer and detonator and is maintained in the unarmed (out-of-line) position.

(4) The booster assembly consists of a booster housing, lead-in cup and appropriate explosive charges. The threads on the booster housing enable the booster assembly to be threaded into the lower portion of the firing pin body.

Differences between Models:

Externally the M427 fuze is identical to the M423 fuze. The M427 differs from the M423 in that its internal construction is designed to produce the longer arming time and arming distance required for launch from high-speed aircraft. For the authorized warheads which use these fuzes, refer to paragraph 3-2, Table 3-1.

Functioning:

When the rocket motor is fired, sustained acceleration permits the set-back (inertial mass) weight to move rearward. This releases the unbalanced rotor which, in rotating, drives the escapement and gear assembly. The rotor arms when it

has traveled the specified arming distance from the launcher. It is locked in the armed position by a spring-loaded pin. The rotor will return to the unarmed position if the minimum rocket energy (product of acceleration and time) is not sustained throughout the arming distance. Upon impact, the striker-pin body walls are crushed between the target and the firing pin body. The firing pin then impacts with the safety and arming mechanism, firing the primer and detonator, respectively. The detonator initiates the explosive train.

Tabulated Data:

Models -----	M423, M427
Type -----	Mechanical, point-detonating
Weight -----	0.75 lb
Length (total) -----	4.0 in.
Intrusion -----	0.90 in.
Diameter -----	1.75 in.

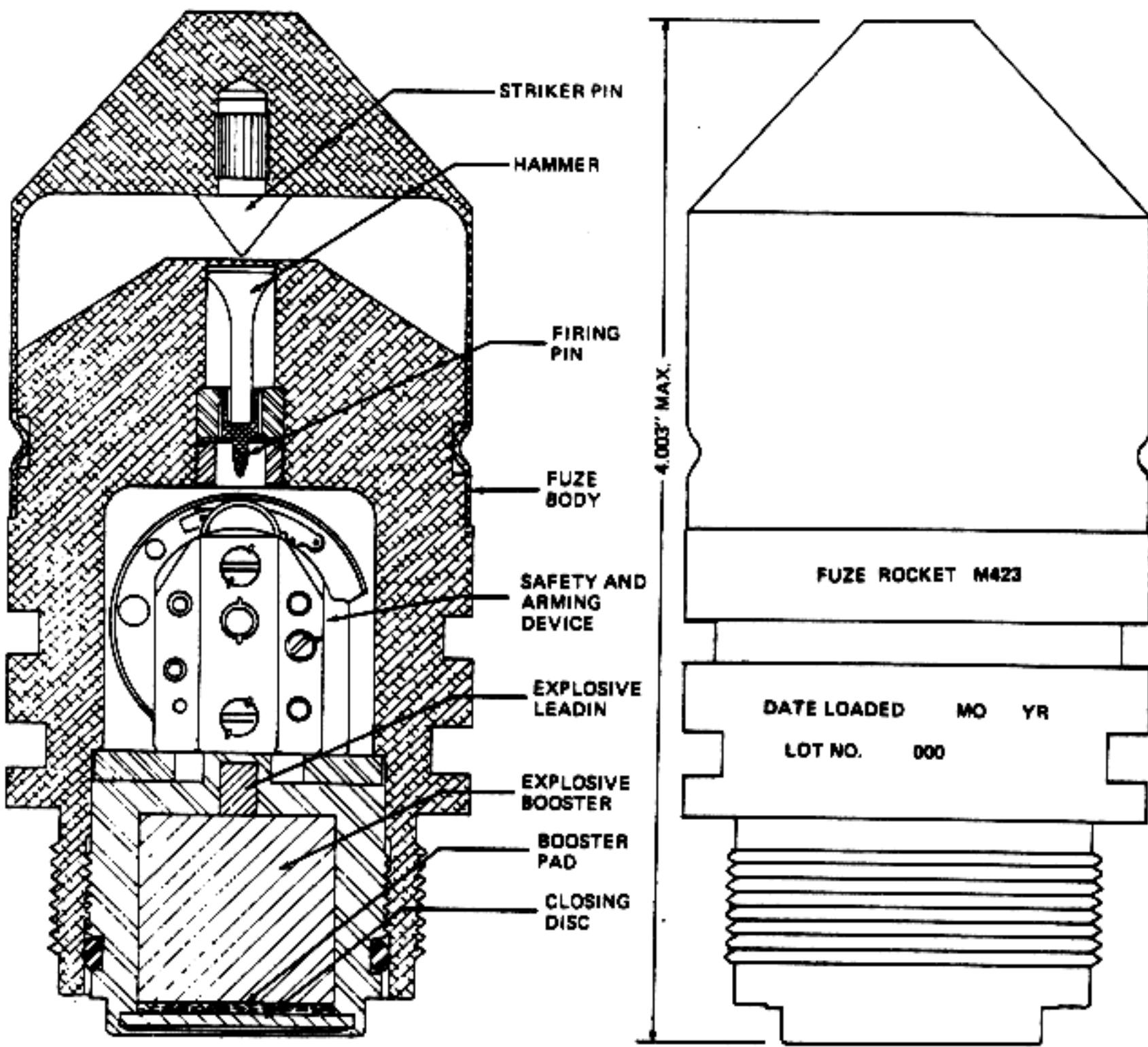
Shipping and storage data:

Storage class/	
SCG -----	M423-1.2 (04)
	M427 - 1.1
DOT shipping	
class -----	M423-C & M427-A
DOT	
designation -----	DETONATING FUZES, CLASS A/C EXPLOSIVES - HANDLE CARE-FULLY DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVES
Field storage ---	Group B

DODAC:

M423 -----	1340-J349
M427 -----	1340-J346

FUZE, POINT DETONATING, M423 (M427)

Type Classification:

STD AMCTCM 3233

Use:

These fuzes are oblique impact sensitive, point detonating, super-quick types. Refer to paragraph 3-1, Table 3-1 for the authorized warheads which use this fuze.

Description:

These fuzes consist of the following major assemblies:

- (1) The striker-pin body assembly consists of an aluminum body with a press-fitted steel striker pin. The lower portion of the body is secured to the firing pin body by a circumferential crimp. Upon impact,

Drawing numbers:

M423 ----- 8883683
 M427 ----- 8883745

Color ----- Olive drab w/black markings

Temperature limits:

Firing ----- -65° to +165°F
 (-53.35° to +73.15°C)
 Storage ----- -65° to +165°F
 (-53.35° to +73.15°C)

Explosive train:

Primer ----- Stab M104
 Detonator ----- Mk 59
 Load ----- Tetryl
 Booster ----- Tetryl

Explosive weight --- 0.32 oz (9 g)

Arming distance:

M423 ----- 46.9 - 1011 yd
 (43 - 92 m)

M427 ----- 220 - 396 yd
 (200 - 360 m)

Rocket terminal

angle ----- 5° - 90°

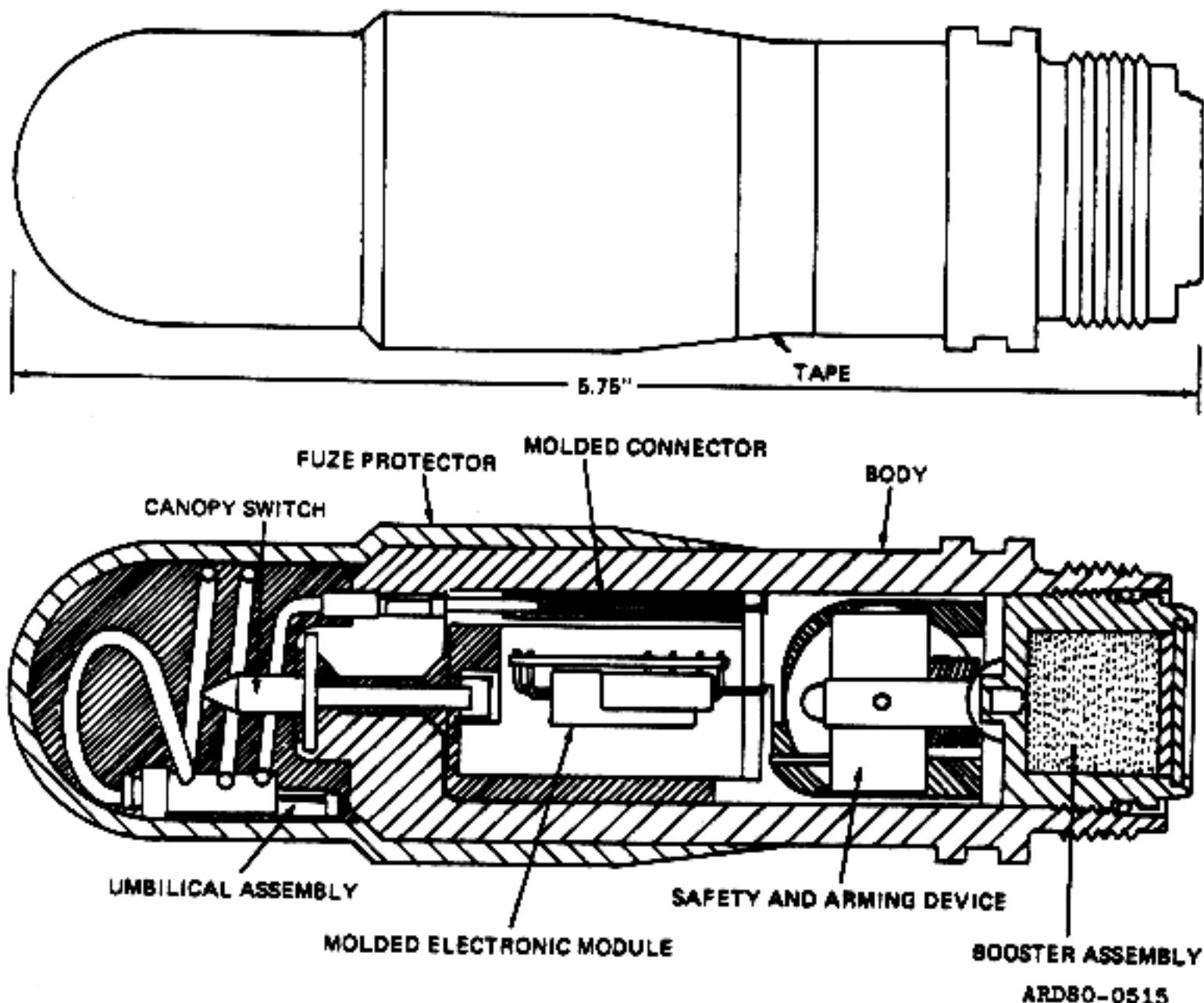
Packing ----- 12 per metal container; 2 container per wire bound box

Packing box:

Weight ----- 39.8 lb (17910 g)
Dimensions ----- 14-5/8 in. x 12-
 13/16 in. x 9-1/8 in.

cm)
Cube ----- 1.0 ft³

FUZE, ROCKET, ELECTRONIC TIME, M433

Type Classification:

STD MSR

Use:

This fuze is an electronic multi-option time delay fuze with selectable functioning modes for forest canopy penetration, bunker structure penetration and super-quick for open terrain. Refer to paragraph 3-2, Table 3-1 for the authorized warheads which use this fuze.

Description:

The fuze body is steel. A forest canopy switch extends from the nose of the fuze to signal to the fuze electronic circuit when first contact is made with the forest canopy. An umbilical assembly is positioned at the nose of the fuze for electrical connection to the M433 Fuze Safety and Timing Device located in the helicopter. Internally, the fuze consists of a resistance capacitance (RC) electronic time circuit, a safing and arming mechanism with an electrical M84

detonator and a booster assembly. The fuze has a selectable time delay range that depends on the height of the forest canopy (40 to 130 ft). It has no internal battery. Required voltage is supplied by the aircraft via the safety and timing device 160 milliseconds prior to the rocket being fired. During this period, the fuze is charged to give the time delay selected by the pilots.

Differences between Models: N/A

Functioning:

After first contact with the forest canopy a delay timer is activated which results in warhead functioning beneath the canopy, but above ground level. The bunker structure penetration mode is incorporated into the fuze to defeat the medium hardness targets constructed of logs, earth, bricks, etc. The fuze can be set from the cockpit for penetrating up to 10 feet of protection and destroying the target from within. The hard target penetration RC timer is activated by inertial switch sensing setback in excess of 1000 G's. Also, an SQ point detonating feature is included to provide operational flexibility in open terrain. This mode is achieved by setting delay to zero. First contact with any surface detonates the round.

Tabulated Data:

Model -----	M433
Type -----	Electronic
Weight -----	1.8 lb
Length -----	5.75 in.
Intrusion -----	0.72 in.
Diameter -----	1.88 in.
Color -----	Olive drab w/black markings

Temperature limits:

Firing -----	-65° to +165°F (-53.35° to +73.15°C)
Storage -----	-65° to +165°F (-53.35° to +73.15°C)
Delay -----	0.0 - 0.5 sec
Packing -----	8 per metal container; 2 containers per wirebound box

Packing box:

Weight	
w/contents -----	57.8 lb
Dimensions -----	14-5/8 in. x 12-13/16 in. x 9-1/8 in.

Cube -----	1.0 ft ³
------------	---------------------

Shipping and storage data:

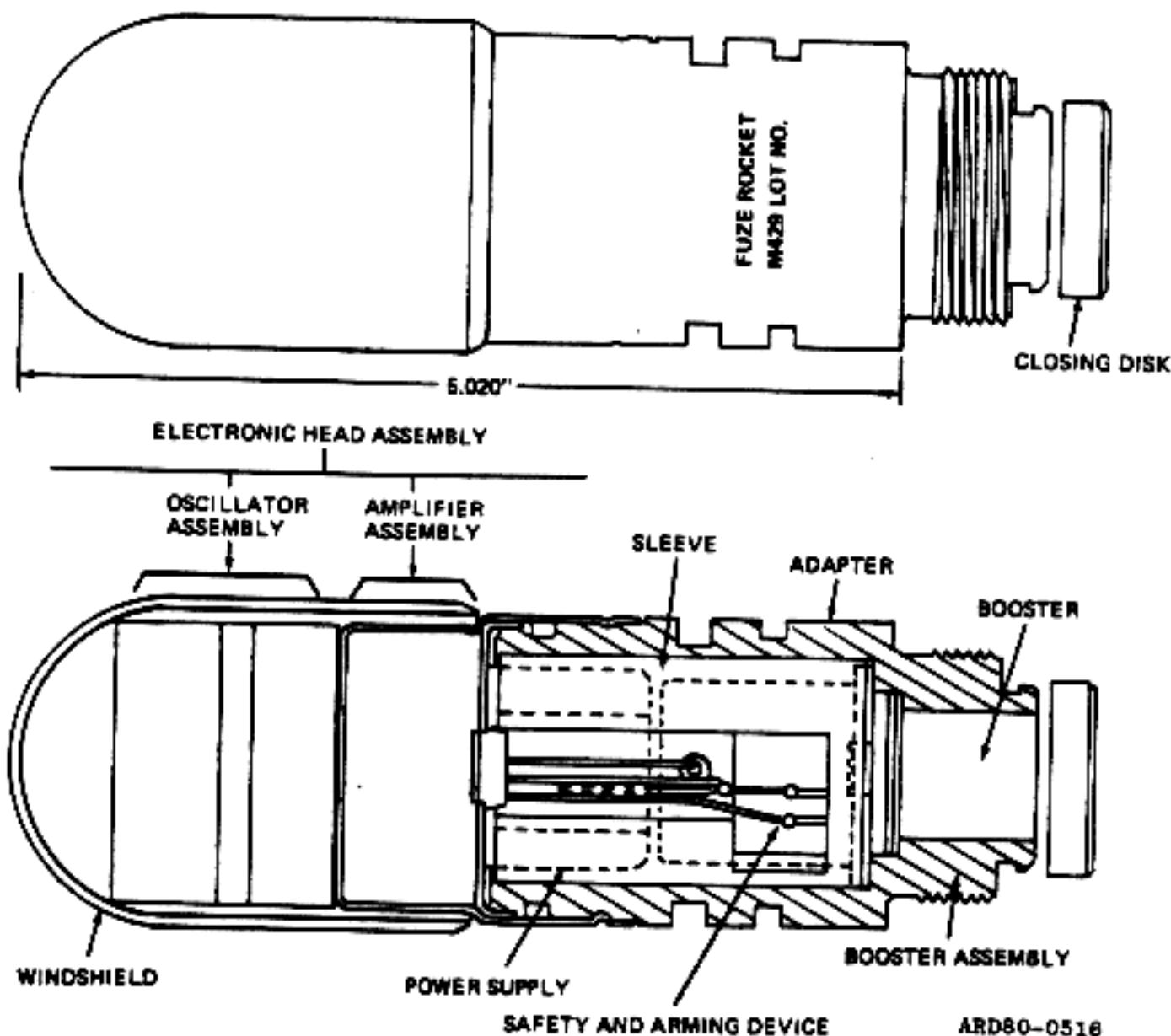
Storage class/	
SCG -----	1.1B
DOT shipping	
class -----	A
DOT	
designation -----	DETONATING FUZES, CLASS A EXPLOSIVES - HANDLE CARE-FULLY - DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVES

Field storage ---	Group B
-------------------	---------

DODAC -----	1340-J351
-------------	-----------

Drawing number ---	9239696
--------------------	---------

FUZE, ROCKET, PROXIMITY, M429

Type Classification:

AMC TCM or OTCM 6393

Use:

This fuze is an all transistorized, continuous wave, doppler device to provide airburst characteristics. It was designed primarily for use with HE warheads for improved anti-personnel effectiveness. Refer to paragraph 3-2, Table 3-1 for the authorized warheads which use this fuze.

airburst electronics. The arming mechanism is similar to that contained in the M423/M427 Fuze except that it has been modified to include an electric detonator as well as a battery starter assembly to initiate an electric battery. An electric detonator is assembled in the rotor. A plastic (lexan) sleeve houses the thermal battery which is located directly above the safety and arming device.

Differences between Models: N/AFunctioning:

The battery starter assembly is activated when an interlock arm secured to the rotor releases a spring-activated firing

Description:

A super-quick impact switch serves as a backup in the event of failure of the

pin after the first 25° of rotor rotation. After 60° of rotation the electrical circuit is completed. Activation of the battery initiates a continuous radio frequency (RF) signal and charges the firing capacitor. When the reflected signals reach a specific intensity, the amplifier firing circuit provides a pulse to the firing circuit by discharging a firing capacitor through the electric detonator.

Tabulated Data:

Model ----- M429
 Type ----- Electrical
 Weight ----- 0.80 lb
 Length (total) ----- 5.91 in.
 Intrusion ----- 0.9 in.
 Diameter ----- 1.89 in.
 Color ----- Olive drab w/black marking; white nose

Temperature limits:

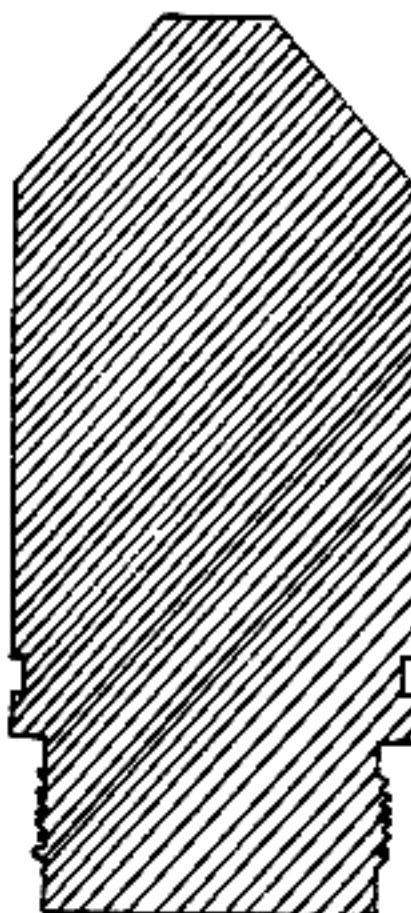
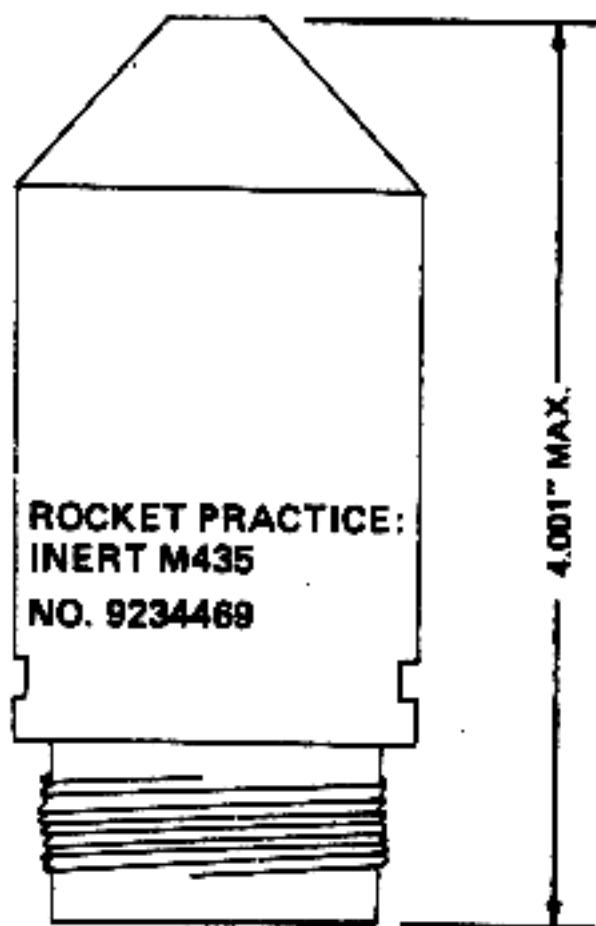
Firing ----- -40° to +140°F
 (-39.6° to +59.0°C)
 Storage ----- -40° to +140°F
 (-39.6° to +59.0°C)

Explosive train:

Detonator ----- Stab, M81
 Booster ----- Tetryl

Total explosive weight ----- 0.32 oz (9 g)
 Arming distance --- 165 - 363 yd
 (150 - 330 m)
 Rocket terminal angle ----- 5° - 15°
 Packing ----- 10 metal containers per wooden box with fuze wrench
 Packing box:
 Weight
 w/contents ----- 39.8 lb (17910 g)
 Dimensions ----- 14-5/8 in. x 12-13/16 in. x 9-1/8 in.
 Cube ----- 1.0 ft³
 Shipping and storage data:
 Storage class/SCG - 1.2B (04)
 DOT shipping class - C
 DOT designation --- DETONATING FUZES, CLASS C
 EXPLOSIVES - HANDLE CAREFULLY
 Field storage ---- Group B
 DODAC ----- 1340-J350
 Drawing number --- 11705900

FUZE, PRACTICE, ROCKET, M435



ARD80-0517

Type Classification:Functioning: N/AUse:

This fuze is used with practice warheads for training purposes. Refer to paragraph 3-2, Table 3-1 for the authorized warheads used with this fuze.

Description:

This is an inert fuze. It simulates point detonating fuzes M423 and M427 generally in length, weight and configuration.

Differences between Models: N/A

<u>Model</u> -----	M435
<u>Type</u> -----	Practice
<u>Body material</u> -----	Aluminum
<u>Length (total)</u> -----	4.0 in.
<u>Intrusion</u> -----	0.9 in.
<u>Diameter</u> -----	1.75 in.
<u>Color</u> -----	Blue w/white markings
<u>Packing</u> -----	81 per carton; 1 carton per wooden box
<u>Packing box:</u>	
<u>Weight</u>	
<u>w/contents</u> -----	70.0 lb

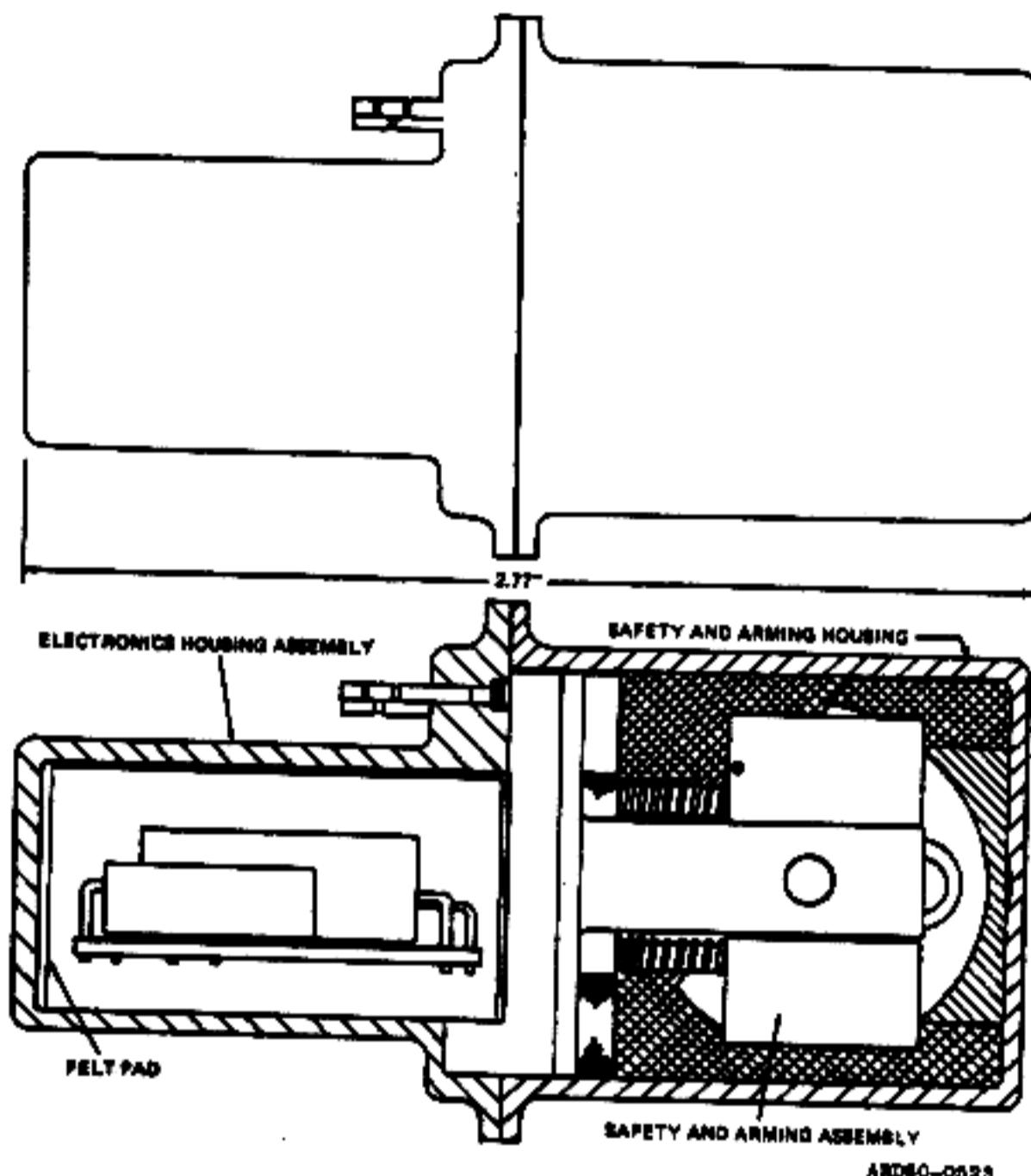
Dimensions ---- 19-5/16 in. x 18 in. x 5-3/8 in.

Cube ----- 1.1 ft³

DODAC ----- 1340-J318

Drawing number---- 9234469

**FUZE, ROCKET, M439, RC, VARIABLE TIME DELAY,
REMOTELY SETTABLE**



Type Classification:

Limited Procurement (LP)-T

Use:

This electronic fuze is designed to be base mounted in flechette and cargo warheads. The output is a forward, axially directed detonation. It is a resistance-capacitance variable time delay fuze which allows the pilot to remotely set the fuze for an air burst at the desired functioning range from the cockpit just prior to firing the round. The fuze and Remote Set Fuze

Subsystems are calibrated to provide proper standoff of the warhead when fired at ranges of five hundred (500) to six thousand nine hundred (6900) m. Refer to Table 3-1 for authorized warhead.

Description:

The fuze consists of a module plastic housing assembly, a safety and arming device plastic housing, a mechanical safety and arming device, and a molded electronics assembly.

The S&A device consists of an unbalanced

rotor assembly which houses the M84 electrical detonator, an escapement and gear assembly (delay mechanism), a single pole double-throw (SPDT) switch, and a spring loaded setback weight. The SPDT switch is in the closed position to connect the fuze electronic time circuit to the umbilical cable assembly for charging.

On initial setback, the switch is transferred to the open position which disconnects the fuze time circuit from the umbilical assembly, as a safety provision. If the fuze is armed or partially armed prior to rocket launch, it cannot be charged. A rocket launch in this condition will result in a dud. The detonator is held shorted and disconnected from the fuze circuit until it reaches an in-line position with the expelling charge.

The fuze must be subjected to a sustained acceleration in order to arm. If acceleration is too low, the spring loaded setback weight will not release the rotor. If acceleration is sufficient for the setback weight to release the rotor, but time-of-acceleration (rocket motor burn) is too short, the setback weight will return the rotor to the unarmed (safe) condition.

The fuze has a selectable time delay range which may be set manually by the pilot or automatically by the advanced fire control system. It has no internal battery and the required voltage is supplied by the aircraft via the Remote Set Fuze Subsystem, just prior to firing the round.

If the fuze has been charged and fired, and duds, it will take approximately 45 days for the charge to decay so that the fuze is safe. If the fuze is set (charged) and the motor fails to ignite, it may be loaded into another tube and fired. The fuze may be set a second time; however, it will function

longer than set time and should not be used for accurate measurements: for accuracy, 10 days should elapse before resetting.

Functioning:

Upon receipt of the fire signal from the pilot, the remote fuze setter processes the proper time constant (delay) to the fuze immediately prior to firing the rocket. The intervalometer circuit delivers a 60 ms or up to 180 ms pulse interval, depending upon the firing rate selected and the particular fire control subsystem. The pulse is divided into a 45 ms fuze charging pulse (constant time window regardless of firing rate) and a rocket firing pulse of from 10 ms to 45 ms. The remaining ms are used as a dwell interval to maintain spacing between pairs of rockets.

After the rocket is fired and experiences sustained acceleration, the setback weight moves rearward and allows the unbalanced rotor to rotate; the fuze timing is started. Rotation is delayed by a runaway escapement to provide an arming delay (0.63 to 0.83 seconds, a function of the acceleration) until the rocket is a safe distance from the aircraft. When the rotor has locked into place with the M84 detonator lined up with the propellant charge, the fuze is armed; the detonator is now electrically connected to the firing circuit, the connection between the electronic module and the umbilical cable assembly is broken.

From 1.2 to approximately 25 seconds after firing, depending upon the range setting, the detonator is initiated electrically and ignites the expelling charge. The energy required to fire the M84 detonator, in M439 Fuzes, is 500 ergs at approximately 8 volts. This energy is supplied from the firing capacitor after time rundown in the fuze. The

resistance of the M84 detonator varies from 2.0 to 5.0 ohms.

Tabulated Data:

Model -----	Fuze, Rocket M439
Type -----	Electronic (resistance-capacitance time delay)
Weight -----	0.4 lb
Length (overall) ---	2.77 in.
Diameter (max) ----	1.48 in.
Operational temperature -----	-55° to +160°F (-47.85° to 70.4°C)
Detonator -----	M84 electrical
Setback to arm ----	0.79 + 0.18 oz (22 + 5 g)
Arming distance ---	105.6 - 138.6 yd (96 - 126 m)
Delay-----	0 - 25 sec
Packing -----	25 per wood or fiber box, w/partitions

Packing box:

Weight

w/contents ----- Wood box, 25 fuzes,
22.0 lb

Dimensions ----- 8-3/4 in. x 8-3/4 in. x 3-1/2 in.

Cube ----- 0.4 ft³

Shipping and storage data:

Storage class/

SCG ----- 1.2B (04)

DOT shipping

class ----- C

DOT designation -- DETONATING FUZES, CLASS C EXPLOSIVES - HANDLE CARE-FULLY

Field storage --- Group B

DODAC ----- 1340-

Drawing numbers

Fuze ----- 9260704

Packaging ----- 9270749, 9270750,
9270751

CHAPTER 5

ROCKET MOTORS

5-1. INTRODUCTION

The Mk 40 LSFAR 2.75-in. rocket motors are fin stabilized and have scarfed nozzles. The scarfed nozzles impart low spin to the rocket and provide additional stability required for deployment from low speed aircraft.

a. The motors are composed of the following subassemblies and components:

(1) Motor tube. Bulkhead motor tubes (see Figure 5-1) are used with the rocket motors. The integral bulkhead motor tube has the motor tube and head closure formed in one piece by impact intrusion. Nozzles of all but Mk 4 rocket motors are scarfed.

(2) Propellant grain and associated fittings. The propellant grain is internally burning grain. It is inhibited on both ends and spirally wrapped with inhibiting tape along the external surface.

(3) Igniter. The Igniter Mk 125 contains one electrical squib. Current passing through the squib bridgewire generates the heat necessary to ignite the squib mix which in turn ignites the powder in the igniter.

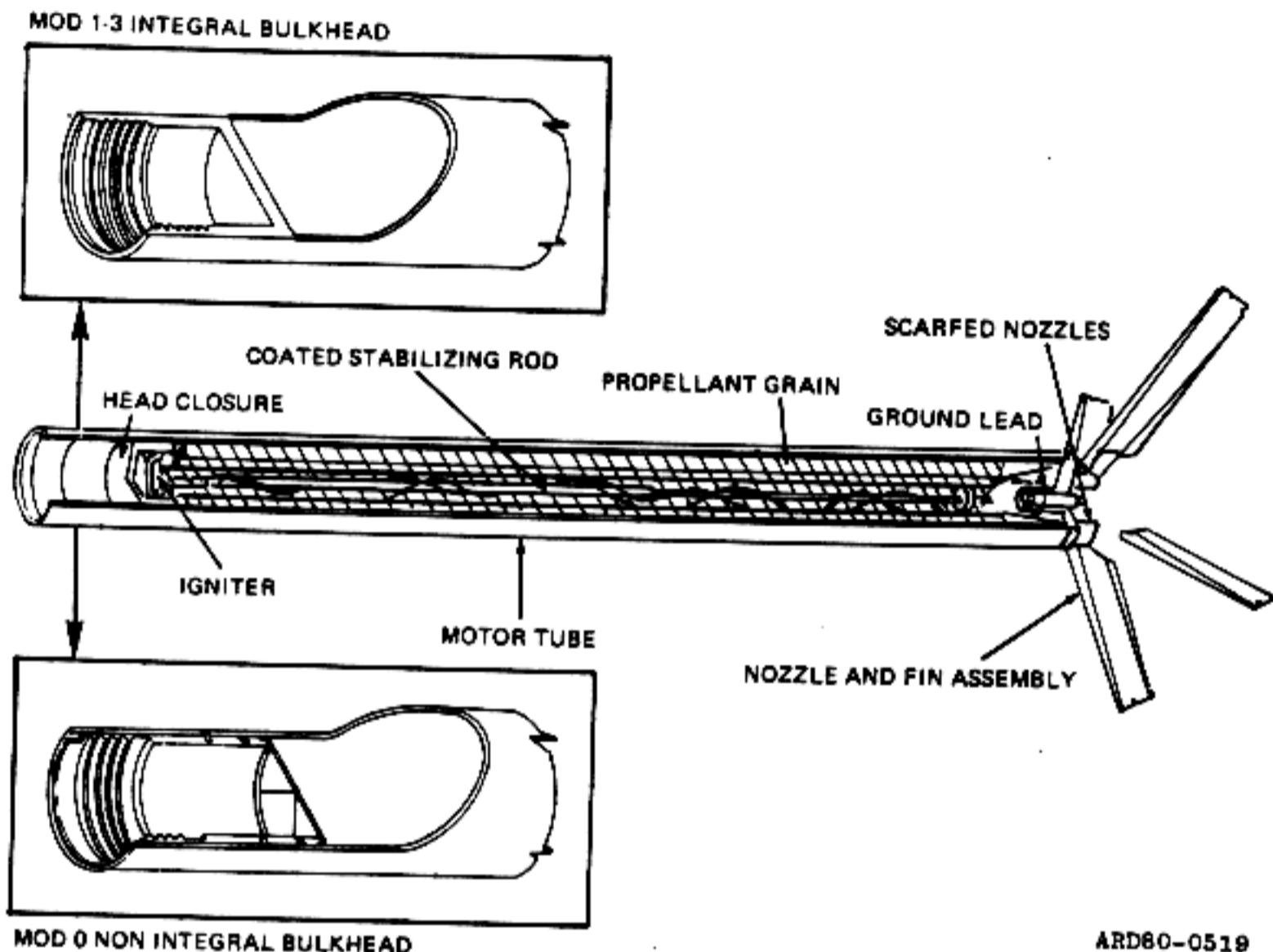
(4) Nozzle and fin assembly. The nozzle and fin assembly for the Mk 40 motor consists of a nozzle assembly (one nozzle plate, four inserts, and four burst diaphragms), a fin actuating mechanism, four fins and a fin retainer. It is attached to the aft end of the motor tube by a lockwire.

b. The Mk 66 motor has improved performance and is being developed to replace the Mk 4 and Mk 40 motors.

5-2. ROCKET MOTOR DATA

The following pages contain pertinent data for rocket motors associated with 2.75-in. rockets.

MOTOR, ROCKET MK40 MOD 3

Type Classification:

differs from that of the Mods 0 and 1 motors in that the igniter has been modified to incorporate a carried, frangible case in lieu of the blowout plug and the squib is located on the periphery of the case in lieu of at the center of the case.

Use:

The motors are used by rotary-wing and other low-speed aircraft. Refer to paragraph 3-2, Table 3-1 for authorized warheads using these motors.

Differences between Models:

Models 1 and 3 have integral bulkhead motor tubes; Mod 0 has a nonintegral bulkhead tube. The igniter of the Mod 3 motor

NOTE

The nozzle closure on Mods DOD 1 was a blow-out plug which has been changed to frangible steel burst diaphragm on the Mod 3. Stocks of obsolete Mk 40 Mod 0 or 1 motors, if still available, should be disposed of and replaced with Mk40 Mod 3 motors.

Functioning:

Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

Tabulated Data:

Model ----- Mk 40, Mods 0, 1,
and 3

Weight (nominal) --- 11 lb

Length (overall) ---- 39.3 in.

Propellant grains:

Model ----- Mk 43, Mod 1

Configuration --- 8-point star perforated cylinders

Propellant ----- N5 (Mk 43)

Type ----- Double base

Burn time ----- 1.55 - 1.69 sec

Weight ----- 5.9 lb

Thrust

(over at 77°F) --- 720 lb

Impulse (77°F)----- 1150 lb/sec

Igniter:

Mods 0, 1 ----- Mk 125, Mod 4

Mod 3 ----- Mk 125, Mod 5

Resistance:

Mk 125, Mod 4 -- 0.70 ohms to
1.50 ohms

Mk 125, Mod 5 -- 0.70 ohms to
2.00 ohms

Squib ----- Mk 1, Mod 0

Igniter charge:

Black powder --- 80 percent

Coated magnesium

powder----- 20 percent

Weight ----- 0.36 oz (10 g)

Burning time---- 0.2 sec

Temperature limits:

Firing ----- -65° to +150°F
(-53.35° to 64.9°C)

Storage----- -65° to +150°F
(-53.35° to 64.9°C)

Motor Burnout:

Range ----- 1460 ft (445 m)
Velocity ----- 1965 fps (599 mps)

Launch spin rate

(at launch)----- 1 rps

Launcher exit velocity

(64.5 in. tube) --- 112 fps

Acceleration:

Initial ----- 35-40

Final ----- 40-45

Range ----- Max at 43° QE
with MPSM warhead
8,080 m

Color code: ----- White w/brown band
near head and black
markings

Packing ----- 1 motor w/propellant
grain, coated sta-
bilizing rod ignition
and fin assy in fiber
container; 6 con-
tainers per wooden
box

Packing box:

Weight

w/contents ----- 131 lb

Dimensions----- 46-3/16 in. x 11-7/8
in. x 9-9/32 in.

Cube ----- 2.8 ft³

Shipping and storage data:

Storage class/

SCG ----- 1.3C

DOT shipping

class ----- Group B

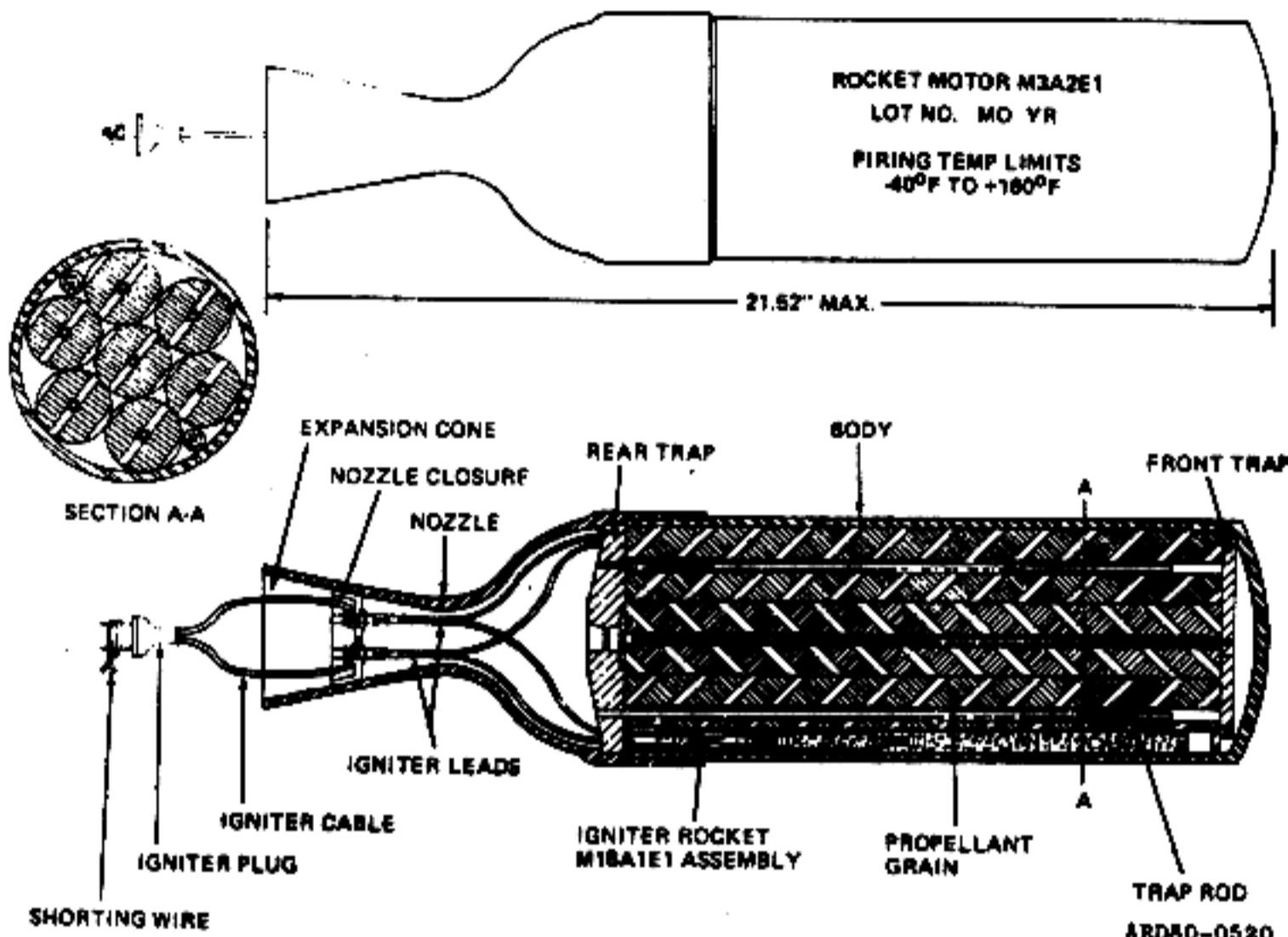
DOT

designation ----- ROCKET MOTORS

DODAC ----- 1340-J106, Mk 4
Mod 10
1340-J107, Mk 40
Mod 0

1340-J108, Mk 40
Mod 13
Drawing numbers --- 1373658
9220803

ROCKET, MOTOR (JATO) M3A2

Type Classification:

STD AMCTC 1106

Use:

The rocket motor is a solid-propellant thrust unit used primarily for launching target planes from a catapult, although it may be used for other applications requiring a unit of the same characteristics.

Description:

The JATO M3A2 rocket motor consists of the following:

Body assembly. The body assembly is a cylindrical steel tube closed at the forward end by the head and threaded externally at the open rear end to receive the nozzle.

Nozzle. The nozzle, which is of steel,

is of the convergent-divergent type comprising a conical rear portion and cylindrical forward portion. The cylindrical forward end of the nozzle is threaded internally to engage the rear of the body assembly.

Igniter plug assembly. The igniter assembly consists of a "shorted" igniter plug and a nozzle closure which are connected by two lengths of igniter cable. The nozzle closure is a plastic, cup-shaped disk into which two copper terminal inserts are molded. The closure is cemented permanently into the expansion cone. The igniter plug is a standard, two-pronged, rubber-bodied electric plug which is short-circuited by a copper wire tied across its prongs. The two cables from the plug are crimped into the terminal inserts in the nozzle closure.

Igniter assembly. The igniter assembly is designated "Igniter, JATO, M21." It consists of a plastic igniter case containing a 463-grain charge of black powder, two squibs, each of 1.0 ohm resistance, and two 24-in. long external lead wires which are connected to the squibs. Electric terminals for the squibs and lead wires are riveted to the plastic wall of the igniter case. The lead wires pass through the center of the JATO and are crimped into the copper terminal inserts in the nozzle closure.

Propelling charge. The propelling charge consists of seven monoperforate cylindrical extruded grains of double-base propellant M16 (T6). The grains are arranged in the JATO lengthwise with one grain in the center and six grains surrounding it.

Rear trap assembly. The rear trap assembly is a star-shaped steel casting with six equally spaced radial arms and

a hexagonal center hole. Six cylindrical trap rods, one each from each radial arm, extend axially toward the forward end of the JATO to form a cagelike support which receives six of the seven propellant grains.

Front trap assembly. The front trap assembly is a wheel-shaped steel casting comprising an outer ring, center hub, and three radial spokes. A cylindrical trap rod extends from the center of the hub axially toward the rear of the JATO. This rod receives the seventh (center) grain of the propelling charge.

Functioning:

The JATO is designed to function safely and reliably when connected to any electrical source which will deliver 2 amperes at a minimum of 1-1/2 volts, although higher voltages may be used if desired. Satisfactory results have been obtained by ignition from ordinary 110-volt house current. Applying current through the igniter cable activates the 463-grain charge of black powder, which ignites the propelling charge. Burning creates a rapid expanding gas which can only escape through the nozzle assembly. The nozzle assembly is designed for a venturi effect which further compresses the gas and increases the thrust required to launch the rocket or aircraft.

Tabulated Data:

Complete Rocket, Motor:

Type -----	JATO M3A2
Weight, loaded ---	27.1 lb
Weight,	
after fired -----	17.6 lb
Length (including	
nozzle) -----	21.51 in.
Diameter Outside	
(nozzle) -----	5.38 in.
Diameter Body ---	5.12 in.

Diameter (inside body) ----- 4.75 in.
 Diameter, Nozzle throat ----- 1.28 in.
 Catapult used with ----- A-7

Components:

Propelling charge:

Type ----- M21 extruded solid tabular

Weight ----- 9.2 lb

Igniter:

Type ----- M18A1E1

Weight ----- 0.14 lb

Weight (plug assembly) ----- 0.12 lb

Performance:

Burning time --- CONF

Thrust ----- CONF

Temperature limits:

Firing ----- -40° to +160°F
 (+4° to +70°C)

Storage ----- -60° to +70°F
 (+15° to +21°C)
 (cool dry area)

Packing ----- Two per wooden box
 Packing box:
 Weight
 w/contents ----- 71.7 lb
 Dimensions ----- 26-7/8 x 12-1/2 x
 7-1/2 in.

Volume----- 1.44 ft³

Shipping and storage data:

Storage class/

SCG ----- J

DOT shipping

class ----- A

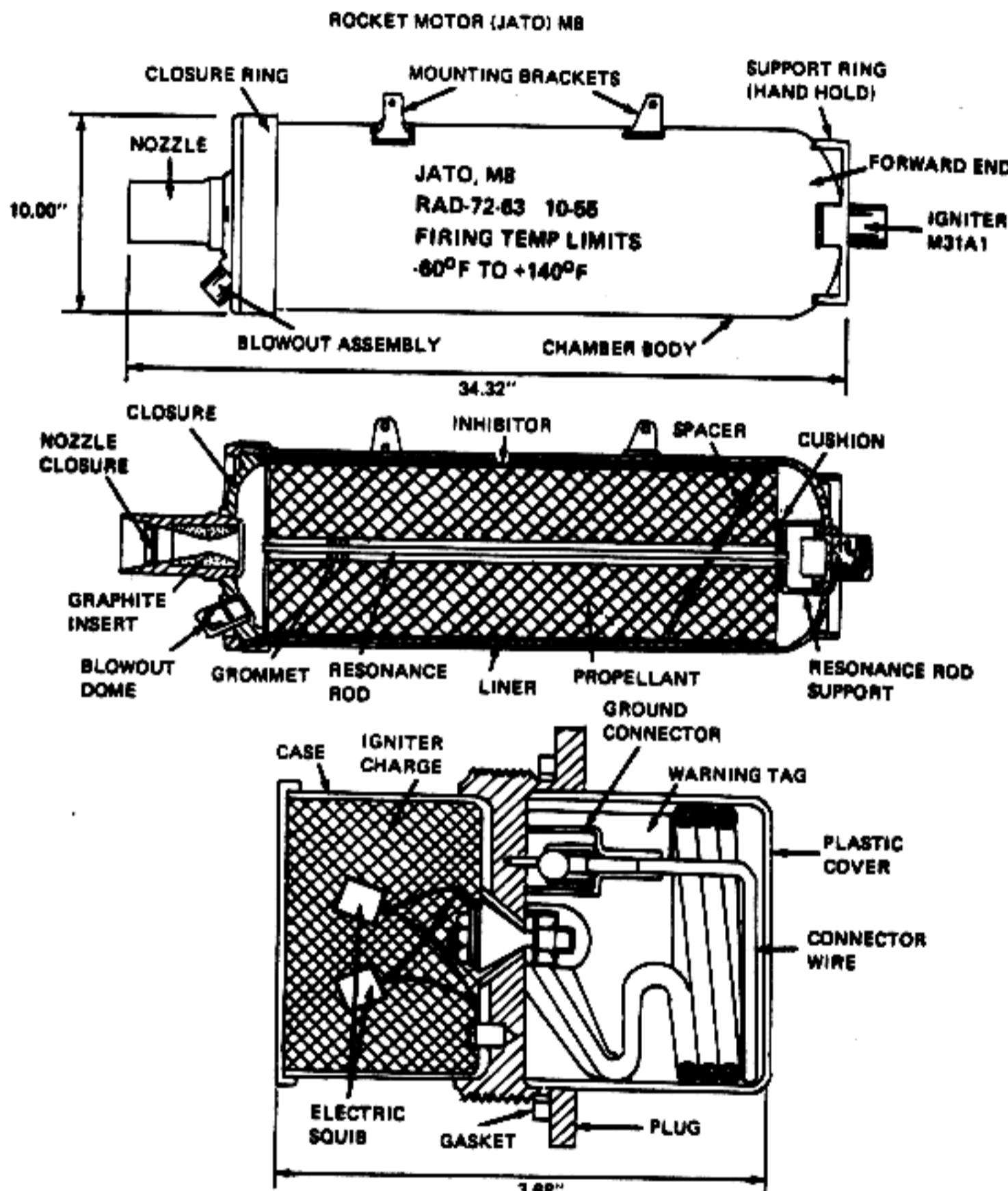
DOT

designation ----- ROCKET MOTOR
 FOR ASSIST IN
 LAUNCH OF TAR-
 GET PLANES

DODAC ----- 1340-H305

Drawing number --- 8799792

ROCKET MOTOR (JATO) M8



ARD80-0521

Type Classification:

STD OTCM/AMCTC 36841

Use:

The JATO M8 is a solid-propellant thrust unit used primarily for applying thrust to assist aircraft on take-off. It can be used for other applications requiring units of the same characteristics.

Description:

The JATO M8 rocket motor consists of the following:

Body assembly — a deep-drawn steel case with a thicker ring welded to the rear (aft) end, which provides the chamber for loading the propelling charge.

Closure assembly — which seals the rear (aft) end of the JATO and provides a mount for the nozzle and blowout assemblies.

Igniter assembly — consists of a plastic igniter case which contains the igniter charge.

Functioning:

The igniter assembly is ignited by two electric squibs, Mk 1 Mod 0, connected in parallel. In turn, the propellant is ignited. The pressure created by the expanding propellant gases can only be vented through the nozzle assembly. The nozzle assembly is designed for a venture effect which compresses the gases generated and increases the thrust required to assist launch of the desired item.

Tabulated Data:**Complete Rocket Motor:**

Type -----	JATO M8
Weight, loaded --	158.5 lb
Length (max) -----	34.32 in.
Diameter (max) --	10.0 in.
Used with -----	Assist aircraft on take-off

Components:**Propelling charge:**

Type -----	M301, Cast OGK
Weight -----	70.0 lb

Igniter assembly:

Type -----	M31A1
Igniter charge --	87 grains of igniter composition

Electric squibs -	2 (Mk 1 Mod 0)
Length -----	3.68 in.

Performance:

Burning time ----	14.0 sec
Thrust -----	1000 lb

Temperature limits:

Firing -----	-60° to +140°F (-51° to +59°C) Restricted to temperature ranges marked on JATO)
Storage -----	60° to 70°F (15° to 21°C) (cool dry area)

Packing -----	One per wooden box
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Packing box	Wooden
Weight -----	224.9 lb
Dimensions-----	39-3/4 in. x 16-7/32 in. x 12-1/8 in.

Volume -----	4.5 ft ³
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Shipping and storage data:

DODAC ----- 1340-

Storage class/

SCG-----

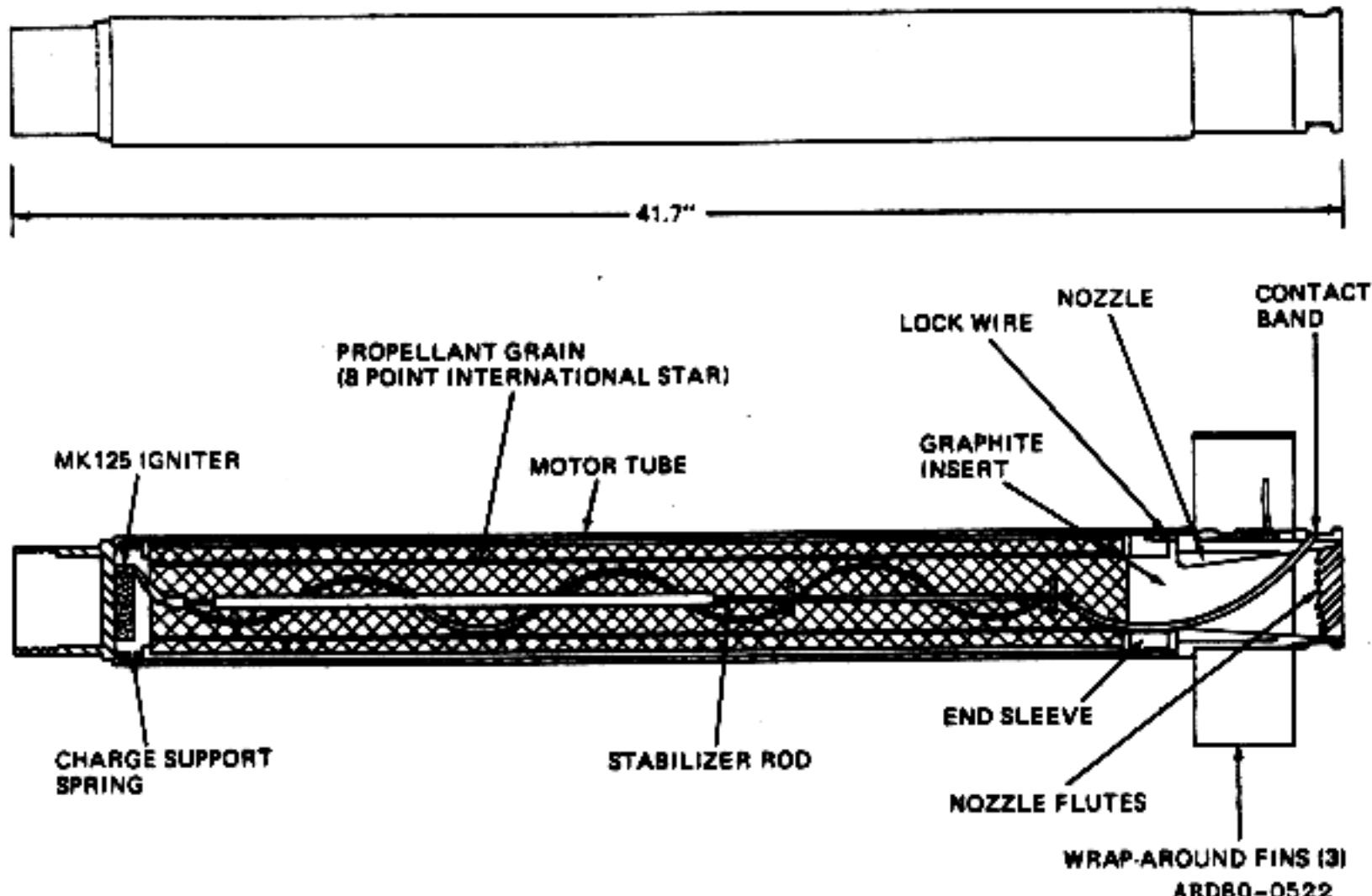
DOT shipping

class -----

DOT designation --- ROCKET MOTOR
TO ASSIST IN AIR-
CRAFT TAKE-OFF

Drawing number --- 82-6-25

ROCKET, MOTOR MK66, MODS 0, 1

Type Classification:

STD AMCTCM 955

Use:

The motors are used by rotary wing and other low speed aircraft; they may also be used with high performance aircraft.

Differences between Models:

The MK 66 motors utilize a longer motor tube (than the MK40) of a different aluminum alloy, and a new nozzle and fin assembly. The fins are of a spring loaded, wrap-around design and are attached around the circumference of the single nozzle. The propellant grain is longer and of a different

formation than the standard grain; however, the stabilizing rod and igniter are essentially the same as used on the MK40 motor. The MK66 motors have a substantially higher thrust, 1300 lbs, and a longer range. The MK66 Mod 0 was developed by the Navy but never fielded.

The MK66 Mod 1 motor is a nozzle modification of the Mod 0 to increase the spin rate from 4 - 5.5 RPS to 9 - 10 RPS (at launch) for increased accuracy, and provide interface with existing and improved launchers. A detent groove has been added forward of the wrap-around fins.

Tabulated Data:

Type ----- MK66 Mod 1

Length ----- 41.7 in.

Weight, shipped

(nominal) ----- 13.6 lb

Burn time (77°F) -- 1.05 - 1.10 sec

Average thrust

(77°F)----- 1300 - 1370 lb

Impulse (77°F) --- 1500 lb/sec

Motor burnout:

Range----- 1300 ft (397 m)

Velocity ----- 2425 fps

Launch spin rate - 10 rps

Launcher ext (64.5

in. tube):

Velocity ----- 148 fps

Acceleration, G

Initial----- 60 - 70

Final ----- 95 - 100

Range - max at

QE 43°;

w/MPSM

warhead ----- 11407 yd (10,426 m)

Igniter:

Resistance, ohms- 0.7 to 2.0

Propellant----- NOSIH AA-2
Type ----- Extruded double base, ethyl-cellulose inhibited, cartridge loaded
Weight ----- 7 lb
Configuration--- 8-point internal burning star

Temperature limits:

Storage ----- -65° to +165°F
(-53.35° to +73.15°C)
Operation ----- -50° to +150°F
(-45° to +64.9°C)

DODAC ----- 1340-H365

Color code ----- Case: white w/brown band near head, black markings

Packing ----- 1 motor w/propellant grain, coated stabilizer rod, igniter and fin assy in fiber container; 6 containers per wooden box (when packed separately from warheads)

Packing box:

Weight

w/contents ----- 146 lb

Dimensions----- 48-5/8 in. x 11-7/8 in. x 9-9/32 in.

Cube ----- 2.9 ft³

Shipping and storage data:

Storage class/

SCG----- 1.3C

DOT shipping

class ----- B

DOT designation-- ROCKET MOTORS

Field storage --- Group F

Drawings: ----- Z33AS100 (Navy)

APPENDIX A

REFERENCES

A-1. Administrative Publications*a. Army Regulations*

Dictionary of United States Army Terms AR 310-25

Authorized Abbreviations and Brevity Codes AR 310-50

*b. Pamphlets*Index of Administrative Publications DA Pam 310-1
(Microfiche only)Index of Blank Forms DA Pam 310-2
(Microfiche only)Index of Doctrinal Training and Organizational Publications DA Pam 310-3
(Microfiche only)Index of Technical Publications (Includes: Equipment
Identification Lists, Lubrication Order, Modification
Work Orders, Supply Bulletins, Supply Catalogs, Supply
Manuals, Technical Bulletins, Technical Manuals and
Technical Publications Rescinded for Active Army Use
But valid For USAR, ARNG, or FMS/IL Programs DA Pam 310-4
(Microfiche only)**A-2. Forms**

Recommended Changes to Publications and Blank Forms DA Form 2028

A-3. Doctrinal, Training and Organizational Publications

Rotary Wing Flight FM 1-51

66-Millimeter High Explosive Antitank Rocket M72A1, M72A2
and M72 FM 23-33**A-4. Equipment Publications***a. Technical Manuals*

Operator's and Organizational Maintenance Manual:

Launcher, Rocket: 66MM, 4-Tube, M202 TM 3-1055-218-12

Operator's and Organizational Maintenance Manual (Including
Repair Parts and Special Tools List): Launcher, Rocket:
66MM, 4-Tube, M202A1 (NSN 1055-00-021-3909) TM 3-1055-456-12

Operator, Organizational, Direct Support and General Support

Maintenance Manual (Including Repair Parts and Special
Tools List With Depot Maintenance Allowance): 2.75-Inch
Aircraft-Rocket Launchers M158A1, M200 and M200A1 (Used
W/Rotary-Wing Aircraft Armament Subsystems) TM 9-1055-460-13&P

Aviation Unit Maintenance Manual: Armament Subsystem,

Helicopter: 7.62MM Machine Gun 2.75-Inch Rocket Launch:

M21 (NSN 1090-00-923-5971) (Used on UH-1B and UH-1C

Helicopters) TM 9-1090-202-12

Aviation Unit Maintenance Manual: Armament Subsystem,

Helicopter: 7.62MM Machine Gun/40 MM Grenade Launcher:

M28A1 (NSN 1090-00-134-3071) (Used on AH-1G Helicopter) TM 9-1090-203-12

Ammunition, General TM 9-1300-200

Ammunition and Explosives Standards TM 9-1300-206

Organizational Maintenance Manual: Rocket Launcher M190 W/Subcaliber 35-MM Practice Rocket M73	TM 9-1340-203-20
Operator's Manual for 66MM Light Antitank Weapon (LAW) System M72A1 and M72A2 with Coupler and Practice Rocket Launcher with M73 Practice Rocket	TM 9-1340-214-10
Organizational Maintenance Manual (Including Repair Parts and Special Tools List): 2.76-Inch Low Spin, Folding Fin Aircraft Rockets; 66MM, TOW Light Anti-tank Weapon Systems; 3.5-Inch Rockets and M3A2E1 Rocket Motor (JATO)	TM 9-1340-222-20
Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) For 2.75-Inch Low Spin, Folding Pin Aircraft Rockets; 66MM Light Antitank Weapon Systems, 3.5-Inch Rockets and M3A2E1 Rocket Motor (JATO)	TM 9-1340-222-34
Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List): Military Pyrotechnics	TM 9-1370-203-34&P
Destruction of Conventional Ammunition and Improved Conventional Munitions to Prevent Enemy Use	TM 750-244-5-1
b. Technical Bulletins	
Munitions Suspended or Restricted	TB 9-1300-385-1
A-5. Supply Catalogs	
Ammunition and Explosives: Classes 1305 through 1330	SC 1305/30-IL
Ammunition and Explosives: Classes 1340 through 1398	SC 1340/98-IL